National Park Service
The U.S. Department of the Interior

Animal and Plant Health Inspection Service
U.S. Department of Agriculture

Mid-Atlantic Network Parks:
Appalachian National Scenic Trail, GA to ME
Eisenhower National Historic Site, PA
Gettysburg National Military Park, PA
Appomatox Courthouse National Historical Park, VA
Booker T. Washington National Monument, VA
Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park, VA
Petersburg National Battlefield, VA
Richmond National Battlefield Park, VA
Shenandoah National Park, VA

Oral Rabies Vaccination Program
Environmental Assessment /Assessment of Effect
December, 2004

Environmental Assessment
Assessment of Effect

Oral Rabies Vaccination Program

Mid-Atlantic Network Parks:
Appalachian National Scenic Trail, GA to ME
Eisenhower National Historic Site, PA
Gettysburg National Military Park, PA
Appomatox Courthouse National Historical Park, VA
Booker T. Washington National Monument, VA
Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park, VA
Petersburg National Battlefield, VA
Richmond National Battlefield Park, VA
Shenandoah National Park, VA

Summary

This Environmental Assessment (EA) documents the analysis of the potential environmental effects of a proposal to involve the U.S. Department of Interior (USDI), National Park Service (NPS) in an oral rabies vaccination (ORVAC) program at several park units (listed above) within the NPS Northeast Region's Mid-Atlantic Network Parks grouping in several eastern states (GA, ME, MD, MA, NH, NJ, NY, NC, PA, TN, VT, VA, and WV). The program would involve the distribution of ORVAC baits to create zones of vaccinated target species that would then serve as barriers to further cease the advancement of raccoon rabies virus variants. The proposed ORVAC program would reduce the possibility of humans and animals becoming infected with the raccoon variant of the rabies virus and would support the aforementioned states in the effort of stopping the spread of a specific raccoon rabies variant or "strain" of the rabies virus and reducing or eliminating this strain of the virus from the eastern United States. Currently, cooperative rabies vaccination programs are already being conducted on various land classes in each of the aforementioned states in addition to numerous other states in the eastern U.S. By participating, the NPS would aid in enhancing the effectiveness of the national program. No cumulative impacts are anticipated from the distribution of ORVAC into the environment.

Public Comment

If you wish to comment on the EA, you may mail comments to the name and address below. This EA will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

USDA-APHIS-WS
Attn: Wendy Servoss
Environmental Coordinator
6213 Angus Drive, Suite E
Raleigh, NC 27617
(919) 786-4480 x229
(919) 782-4159 fax

Appendix B

EXECUTIVE SUMMARY

This Environmental Assessment (EA) documents the analysis of the potential environmental effects of a proposal to involve the U.S. Department of Interior (USDI), National Park Service (NPS) in an oral rabies vaccination (ORVAC) program at several park units within the NPS Northeast Region's Mid-Atlantic Network Parks grouping in several eastern states (GA, ME, MD, MA, NH, NJ, NY, NC, PA, TN, VT, VA, and WV). The EA analyzes a number of environmental issues or concerns with the oral rabies vaccine and activities associated with the program.

The aforementioned thirteen states are involved in an ORVAC program to stop the spread of specific raccoon (*Procyon lotor*) rabies variants or "strains" of the rabies virus and reduce or eliminate this strain of the virus from the eastern United States. If not stopped, these strains could potentially spread to a much broader area of the U.S. and cause substantial increases in public and domestic animal health costs because of increased rabies exposures. The proposed action would be conducted in cooperation with the various state agencies (i.e., health departments, agriculture departments, and wildlife agencies), U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS), and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve the distribution of ORVAC baits to create zones of vaccinated target species that would then serve as barriers to further cease the advancement of raccoon rabies virus variants. The action would involve the use of APHIS-WS federal funds to purchase and distribute ORVAC baits.

The proposed ORVAC program would reduce the possibility of humans and animals becoming infected with the raccoon variant of the rabies virus and would support these thirteen states in the effort of stopping the spread of a specific raccoon rabies variant or "strain" of the rabies virus and reducing or eliminating this strain of the virus from the eastern U.S. Currently, cooperative rabies vaccination programs are already being conducted on various land classes in each of the aforementioned states in addition to numerous other states in the eastern U.S. By participating, the NPS would aid in enhancing the effectiveness of the national program. If baiting programs were conducted around these large land masses, reservoirs of the virus would likely still exist, creating holes in the program and potentially making the program less effective at stopping the forward advance or eliminating the raccoon strain of the rabies virus. No cumulative impacts are anticipated from the distribution of ORVAC into the environment. The ORVAC vaccine and bait that would be used has been found safe to use on raccoon and other animal species, has a negligible risk of causing adverse affects to humans, is readily consumed by target animal species, and does not cause bioaccumulation in the environment. A limited number of baits would be distributed one time per year, thereby limiting the potential for persons to be exposed to an ORVAC bait or to bait distributing equipment.

Appendix B

Table of Contents

Appendix B

Appendix B

1.0 CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 BACKGROUND

1.1.1 Introduction

Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal. The earliest records suggest rabies was present in dogs about 2300 B.C., but the disease probably evolved before recorded history. Despite its long coexistence with humans, rabies is a public and animal health problem that annually results in 50,000 to 70,000 deaths a year worldwide. Up until 1960, most cases of rabies in the United States were reported in dogs. However, the combination of public education and vaccination programs for companion dogs has controlled rabies in dogs. The disease can be effectively prevented in humans and many domestic animal species, but abundant and widely distributed reservoirs among wild mammals complicate rabies control. Within most of the U.S., these reservoirs occur in geographically discrete regions where the virus transmission is primarily between members of the same species (Krebs et al. 2000). These species include but are not limited to raccoons (*Procyon lotor*), coyotes (*Canis latrans*), skunks (primarily *Mephitis mephitis*), gray foxes (*Urocyon cinereoargenteus*), and red foxes (*Vulpes vulpes*). Species specific variants of the virus may be transmitted to other animal species. However these encounters rarely result in sustained virus transmission within that animal species. Once established, virus transmission within a specific animal species can persist at epidemic levels for decades, even perhaps for centuries (Krebs et al. 2000).

The vast majority of rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in raccoons, skunks, and bats (Order *Chiroptera*). Red foxes account for less than 10 percent of the reported rabies cases, with domestic cats, dogs and cattle among those most often reported (CDC 2001a). Two canine rabies epidemics emerged in Texas in 1988, one involving coyotes and dogs in South Texas and the other in gray foxes in West/Central Texas. The South Texas epidemic alone has resulted in two human deaths and caused over 3,000 people to receive postexposure rabies treatment (TDH 2004).

1.1.2 Public Health Importance of Rabies

Over the last 100 years, rabies in the U.S. has changed dramatically. About 90 percent or greater of all animal cases reported annually to CDC now occur in wildlife (Krebs et al. 2000, CDC 2001a). Before 1960 the majority of cases were reported in domestic animals. The principal rabies hosts today are wild carnivores and bats. The number of rabies related human deaths in the U.S. has declined from more than 100 annually at the turn of the century to an average of one or two people/year in the 1990s. Modern day prophylaxis, which is the series of vaccine injections given to people who have been potentially or actually exposed, has proven nearly 100 percent successful in preventing mortality when administered promptly (CDC 2001a). In the U.S., human fatalities associated with rabies occur in people who fail to seek timely medical assistance, usually because they were unaware of their exposure to rabies.

Although human rabies deaths are rare, the estimated public health costs associated with disease detection, prevention, and control have risen, and are estimated to exceed $300 to $450 million annually. These costs include the vaccination of companion animals, maintenance of rabies laboratories, medical costs, such as those incurred for exposure case investigations, rabies post-exposure prophylaxis (PEP) and animal control programs (CDC 2001a). In addition, each year tens of thousands of people are impacted by anxiety, fear, and trauma associated with potential or actual rabies exposure to themselves and their domestic animals. Exclusion, proper storage and disposal of garbage, and removal of problem animals are often effective alternatives to address wildlife rabies threats at specific sites; however, oral rabies vaccination (ORVAC) is the only currently available technique that shows promise for wildlife rabies control on a broad geographic and species scale (Slate et al. 2002).

Accurate estimates of these expenditures are not available. Although the number of PEPs given in the U.S. each year is unknown, it is estimated to be about 40,000. When rabies becomes epidemic or prevalent in a region, the number of PEPs in that area increases. Although the cost varies, a course of rabies immune globulin and five doses of vaccine given over a 4 week period typically exceeds $1,000 (CDC 2001a) and has been reported to be as high as $3,000 or more (Meltzer 1996). In Massachusetts during 1991-95, the median cost for PEP was $2,376 per person

(CDC 2001b). Also, as epidemics spread in wildlife populations, the risk of "mass" human exposures requiring treatment of large numbers of people that contact individual rabid domestic animals infected by wild rabid animals increases. One case in Massachusetts involving contact with, or drinking milk from, a single rabid cow required PEPs for a total of 71 persons (CDC 2001b). The total cost of this single incident exceeded $160,000 based on the median cost for PEPs in that state. Perhaps the most expensive single mass exposure case on record in the U.S. occurred in 1994 when a kitten from a pet store in Concord, NH tested positive for rabies after a brief illness. As a result of potential exposure to this kitten or to other potentially rabid animals in the store, at least 665 persons received postexposure rabies vaccinations at a total cost of more than $1.1 million (Noah et al. 1995).

1.1.3 Raccoon Rabies in the Eastern U.S.

Epizootic rabies among raccoons in the U.S. was first identified in Florida in the 1940s and, therefore, is considered an exotic strain in the U.S. outside this area (C. Rupprecht, CDC, pers. comm. 2003). The affected area gradually expanded into other southeastern states. In the late 1970s, a second focus of rabies among raccoons emerged on the West Virginia/Virginia border (Childs et al. 2000, Krebs et al. 2002). Raccoon rabies was first introduced to the mid-Atlantic region of the U.S. with the translocation of infected raccoons from Florida to Hardy County, WV and Shenandoah County, VA in 1978 and 1979 (Nettles et al. 1979). From these counties, the disease spread rapidly along the east coast and has now become enzootic[1] in all of the east coast states as well as Alabama, Pennsylvania, Vermont, West Virginia, and eastern Ohio (Krebs et al. 2000).

Epizootiologic and virologic investigations indicated this new focus in the mid-Atlantic region resulted from the translocation of raccoons incubating rabies from the southeastern U.S. The epizootic front of the mid-Atlantic outbreak has progressed in a primarily northeasterly direction at a rate of 30-47 km/year. The northern extension of this epizootic reached Canada in 1999 with its first three cases of raccoon rabies confirmed in southern Ontario (Rosatte et al. 2001) and the strain has recently been reported in New Brunswick. To the south, the once separate epizootics of raccoon rabies in the mid-Atlantic and southeastern states converged in North Carolina in 1994 (Childs et al. 2000, Krebs et al. 2002). The epizootic of rabies involving raccoons that developed in the mid-Atlantic region is one of the largest documented outbreaks in the history of wildlife rabies. More than 50,000 cases of rabies among raccoons in eastern states have been reported to the CDC since 1980 (Childs et al. 2000). In most southeastern and mid-Atlantic states, raccoons account for the largest proportion of laboratory-confirmed rabid animals (Woodruff et al. 1991). Most human exposures from rabid raccoons and other wild animals involve animals encountered in the wild. In addition, exposures to rabid wild animals kept as pets have also been documented (Woodruff et al. 1991).

The 1983 arrival of the mid-Atlantic rabies epizootic in raccoons in Washington, D.C. raised interest in raccoon and disease ecology in urban areas, particularly because of the high densities of both humans and raccoons and the increased possibility of transmission of disease from raccoons to humans or domestic animals (Riley et al. 1998). For instance, raccoon density in Rock Creek National Park in Washington, D.C. was from twice to more than 100 times (333.3 to 66.7 raccoons per sq. km) that reported for the species in non-urban habitats and was consistent with the few estimates published for other urban and suburban raccoon populations (Riley et al. 1998). Researchers in urban and suburban areas have found that dense populations of raccoons are more likely to be subject to epizootics of contact diseases such as rabies and canine distemper and may be more likely to continue to harbor a disease after the initial epizootic (Riley et al. 1998). Dense raccoon populations in close proximity to high-density human populations may represent a public health threat as reservoirs of parasites and diseases. For these reasons, management of urban and suburban raccoon populations often is warranted (Prange et al. 2003).

The number of reported cases of rabies among wild and domestic animals increases in summer when people, especially children, are outdoors more often and are, therefore, more likely to come into contact with a rabid animal (Beck 1984). In the U.S., dog-to-dog rabies transmission is rare. Most cases of rabies in dogs and other domestic animals has been reported from areas where rabies is found among wildlife, particularly foxes, skunks, and raccoons (Beck 1984). In the mid-Atlantic outbreak, nine domestic animals had been exposed to 247 rabid raccoons, documenting the importance of the present raccoon problem. Raccoons are a greater threat to dogs and, therefore, people, than skunks, foxes, or bats, even though there are more cases nationwide of rabies among the latter three

[1] A disease present among animals in a particular region or locality.

(Beck 1984). Raccoons are a threat because they thrive in urban and suburban areas, can make use of the human habitats, and are considered by many people to be more "tolerable" than skunks and foxes (Beck 1984). In fact, the CDC reported that raccoons accounted for almost 40 percent of the 7,437 cases of rabies that were reported in the U.S. in 2001 (CDC website: http://www.cdc.gov).

The director of the CDC has indicated that raccoon rabies presents a serious public health problem in the U.S. (letter to APHIS-WS, dated May 29, 2001). Potential direct exposure to rabid raccoons, or indirect exposure by a pet that had an encounter with a rabid raccoon, creates this human health threat. To date, one case resulting in the death of a human is attributable to the raccoon strain of the rabies virus. A 25-year-old, previously healthy northern Virginia man died in June 2003. A diagnosis of rabies had not been considered and was only made 3 months after death when brain tissue was examined. Patient history did not reveal contact with animals and no specific exposure experience could be determined (S. Jenkins, Virginia Department of Health, pers. comm. 2003; L. Orciari, CDC, pers. comm. 2003). Raccoon rabies also increases health care costs. The number of pets and livestock examined and vaccinated for rabies, the number of diagnostic tests requested, and the number of post exposure treatments which are all greater when raccoon rabies is present in an area. Human and financial resources allocated to rabies-related human and animal health needs therefore increase, often at the expense of other important activities and services.

In situations where diseases like West Nile Virus, Lyme Disease, Hantavirus, and Raccoon Rabies, could affect the resources, visitors, and employees, the NPS is directed to look to the U.S. Public Health Service and CDC for guidance. The Management Policies for the NPS state, "for the removal of an exotic species that is already present in a park, all exotic plants and animals that are not maintained to meet an identified park purpose will be managed, up to and including eradication, if (1) control is prudent and feasible, and (2) the exotic species "…poses a public health hazard as advised by the U.S. Public Health Service (which includes the CDC and the NPS Public Health Program) and/or creates a hazard to public safety." For management consideration, the raccoon rabies virus has been determined by the CDC to be exotic to the Northeastern United States. The NPS Public Health Program concurs with the CDC assessment that rabies is a significant public health risk and that every reasonable effort should be made to control the disease (M. Wild, NPS, pers. comm. 2004).

The westward and northward movement of the raccoon rabies front has slowed, probably in response to both natural geographic and man-made barriers. The Appalachian Mountains and perhaps river systems flowing eastward have helped confine the raccoon variant to the eastern U.S. In northeast Ohio, an oral rabies vaccination (ORVAC) program has established an "immune barrier" along its border with Pennsylvania from Lake Erie to the Ohio River near East Liverpool, Ohio that has slowed if not stopped the westward expansion of raccoon rabies. If raccoon rabies breaches this barrier, current live trapping results in Ohio (A. Montoney, APHIS-WS, pers. comm. cited in Kemere et al. 2001) as well as the status of raccoons in the Midwest (Sanderson and Hubert 1982, Glueck et al. 1988, Hasbrouck et al. 1992, Mosillo et al. 1999) suggest that raccoon populations are sufficient for rabies to spread westward along a front at a rate similar to or greater (Rupprecht and Smith 1994) than the rate at which this rabies strain has spread in the eastern U.S. Figure 1-1 shows the potential for spread of this rabies variant across the central portion of the U.S. if it is not stopped.

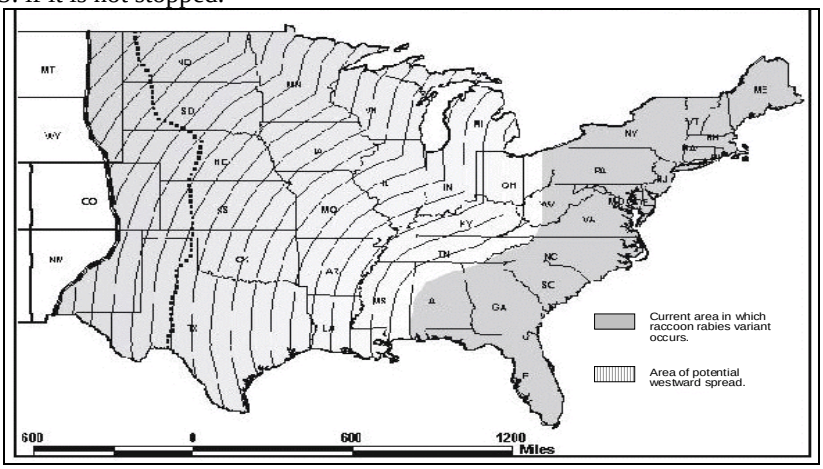

Figure 1-1. Potential areas of the U.S. into which raccoon rabies could spread if not stopped by rabies management programs. From Kemere et al. (2001).

1.1.4 Development of ORVAC and ORVAC Baits

Although the concept of ORVAC to control rabies in free ranging wildlife populations originated in the U.S. (Baer 1988), it has a longer history of implementation in Europe and Canada. The implementation of ORVAC programs in several Western European countries using either attenuated rabies vaccines or the recombinant Raboral V-RG® have resulted in several European countries being designated free of rabies (Slate et al. 2002). In North America, the Province of Ontario, Canada expanded research during the mid-1970s to evaluate the prospect of using ORVAC to eliminate rabies that became established in red foxes in the southern part of the Province during the last 1950s. Since 1989, the Ontario Ministry of Natural Resources has aerially distributed about 12 million baits containing an attenuated rabies virus (ERA vaccine) that has reduced rabies in foxes by more than 97 percent (Slate et al. 2002).

The emergence of raccoon rabies in the U.S. during the 1970s heightened interest in the application of ORVAC to raccoons. Due to biological and ecological differences among the types of animals that transmit rabies, development of specific vaccine and bait combinations was needed. One of the main difficulties was the development of a safe and effective vaccine for raccoons. In contrast to red foxes, which were the primary subjects of ORVAC programs in Europe and Canada, raccoons were not readily immunized by the oral route with the modified "live virus" vaccines that worked well in foxes (Rupprecht et al. 1988). Furthermore, modified "live virus" vaccines pose a small risk of causing vaccine-induced rabies, and have resulted in some cases of vaccine-induced rabies in animals (but no cases in humans) during oral baiting programs in Europe and Canada (Wandeler 1991).

As a consequence of field safety testing in the early 1990's, a vaccinia-rabies glycoprotein (V-RG) vaccine was conditionally U.S. Department of Agriculture (USDA) licensed for vaccination of free-ranging raccoons in 1995 and fully licensed in 1997 in the U.S. (Hanlon et al. 1999). It remains the only effective vaccine licensed for use in the U.S. and Canada for raccoons (CDC 2000). V-RG was also recently licensed by the USDA in 2002 for vaccination of coyotes in the U.S. and Canada (although it is only being used for raccoons in Canada, as canine rabies has not been found in coyotes in Canada). It has also been approved for experimental use by USDA, Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS), Center of Veterinary Biologics for vaccination of free-ranging wild gray foxes in Texas (CDC 2001a, Hanlon et al. 1999).

The V-RG vaccine has proven to be orally effective in raccoons, coyotes and foxes (USDA 2001a, Oertli et al. 2002). This vaccine was extensively laboratory-tested for safety in more than 50 animal species with no adverse effects regardless of route or dose (Rupprecht et al. 1992a). In addition, a domestic animal's annual rabies vaccination can be safely administered even if it recently ingested a dose of oral rabies vaccine (Oertli et al. 2002).

The vaccinia-rabies glycoprotein vaccine used by the ORVAC program is commercially available from MERIAL, 115 Transtech Drive, Athens, GA 30601 under the registered name RABORAL V-RG®. Throughout the remainder of this document, RABORAL V-RG® is referred to as "V-RG". As a recombinant vaccine, the letter "V" is used to denote vaccinia, the self-replicating pox virus that serves as the vector (i.e., carrier) for the rabies virus gene that is responsible for the production of rabies glycoprotein. The letters "RG" stand for rabies glycoprotein which is the protective sheath around the bullet-shaped rabies virus core. The glycoprotein by itself is non-infective and cannot cause rabies, but it serves as an "antigen" which means it elicits an immune response to rabies when the vaccine is swallowed by raccoons, foxes, or coyotes. There is no possibility of vaccine-induced rabies with V-RG because the vaccine only contains the non-infective surface protein of the rabies virus; none of the viral nuclear material (i.e., RNA) which would be required for the rabies virus to replicate is present in the vaccine. Approximately 43.75 million doses have been distributed in the U.S. since 1995 with only one case of vaccinia virus infection reported in humans (resulting in localized skin rashes) to date (Rupprecht et al. *unpublished* 2000, Rupprecht et al. 2001).

A number of studies have been conducted to determine the best bait formulations and strategies for delivery of ORVAC vaccines to raccoons (Hanlon et al. 1989a, Hable et al. 1992, Hadidian et al. 1989, Linhart et al. 1991,

Linhart et al. 1994). When raccoons eat oral rabies baits and puncture a sachet[2] containing the vaccine, the vaccine is swallowed and bathes the lymphatic tissue in the throat area and initiates the immunization process.

A positive rabies antibody titer in an animal from a baited area is most likely due to consumption of a bait and adequate contact with vaccine. However, the lack of a detectable antibody response may not be an accurate reflection of immune status. It is possible that the animal was successfully immunized, but that the blood sample was taken earlier or later than when antibodies could be detected (C. Hanlon, CDC, pers. comm. 2003). Antibodies induced by a one-time oral vaccination appear to be of relatively short duration. Among a group of animals in a baited area, the best time to collect blood samples for detection of antibodies is 4-8 weeks after baiting. A successfully immunized animal may have antibodies shortly after vaccination, but then the level may decline to undetectable levels. If the animal is then exposed to rabies, it is still likely that the animal's "memory" immunity will become activated by the rabies exposure and more antibodies will be made very quickly. The successfully immunized animal will most likely survive exposure, even though it did not have measurable antibodies at the time of the exposure (C. Hanlon, CDC, pers. comm. 2003).

The baits are small blocks of fishmeal that are held together with a polymer binding agent and are considered to be "food grade" materials (Figure 1-2). The baits are rectangular or square in shape with hollow centers. The sachet containing the liquid vaccine is contained in the hollow center of the bait (Figure 1-2). The sachet is composed of a thin plastic material that is not readily digested by the animal ingesting the bait and is subsequently passed through the animal's digestive tract. "Coated" sachets with a simple fishmeal attractant coating have also been field tested with effectiveness that appears to be comparable to fishmeal polymer baits containing the sachet (Linhart et al. *unpublished* 2001). Using the "coated" sachet may be equal in effectiveness at lower cost per vaccinated target wild animal. All baits are marked with a warning label that includes a phone number to call for additional information (Figure 1-2).

Figure 1-2. A (Left): Fishmeal polymer and B (Right): coated sachet baits utilized during the National ORVAC program. (Photos used with permission from MERIAL Limited, Athens, Georgia, USA).

Cornell University recently conducted a study (USDA 2004a) comparing the performance of the coated sachet to fishmeal polymer baits for delivering oral rabies vaccine in the wild. Results from this study, along with those from captive studies being conducted by the APHIS-WS, National Wildlife Research Center, are critical to decisions regarding the best available bait for delivering oral rabies vaccine to raccoons. Preliminary results, yet to be published by Cornell, suggest that the coated sachet performs at least as good as fishmeal polymer bait and often exceeds its performance. Generally higher performance at a lower cost (approximately 20 percent less than fishmeal polymer baits), plus the lower risk of damage from aerial bait distribution, make the coated sachet a good interim bait option while other baits are evaluated for safety and efficacy.

Fishmeal polymer baits contain a tetracycline biomarker. These biomarkers bind to calcium, which can be found in the metabolically active portions of bones and teeth of animals. Tetracycline deposits can be viewed in the teeth or bones with fluorescent light under a microscope. When the tooth or bone sample of an animal is positive for tetracycline, it is likely that the animal has eaten at least one bait and possibly multiple baits (C. Hanlon, CDC, pers.

[2] A thin plastic packet much like those in which condiments (e.g., catsup, mustard) are provided at fast food restaurants.

comm. 2003). The presence of tetracycline, however, is not an indication of immunity since it is possible in some situations for an animal to eat the outer bait matrix without rupturing the vaccine sachet inside. Other potential sources of "background" tetracycline in a study area may include consumption of medicated feeds such as those sometimes used for production animals, intentional treatment by humans with tetracycline, and non-specific fluorescence from undescribed but similar chemical compounds that may be found naturally (C. Hanlon, CDC, pers. comm. 2003).

In field tests conducted in the U.S., the majority of ORVAC baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100 percent of the baits being consumed within a 7 day period (Farry et al. 1998a and 1998b, Hable et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989a, Linhart et al. 1994, Steelman et al. 2000, USDA 1995a). The likelihood of a bait being consumed is dependent upon several factors including animal population densities (target and nontarget species), bait preference, and the availability of alternative food sources. Those baits that are not consumed may remain in the environment for several months after placement dependent upon environmental conditions (precipitation, temperature, etc.) and the condition of the baits. The V-RG virus that is not consumed by the target species or other vertebrates will become inactivated over a relatively short time period. Persistence and stability of the V-RG virus outside of an organism is highly dependent on ambient temperature and local environmental conditions, the higher the temperature the quicker the virus will become inactive (USDA 1992, 1995a). For example, at temperatures between 68 and 100 degrees Fahrenheit the liquid viral vaccine potency remains stable for approximately 14 to 7 days, respectively, in the un-punctured sachet or inside the bait. In situations where the bait and sachet are damaged inactivation of the V-RG virus will occur more rapidly.

1.1.5 Development of ORVAC Programs in the United States

Oral wildlife vaccination for rabies control has been under field evaluation in the U.S. since 1990. At that time a limited field release of the recombinant vaccine occurred on Parramore Island, VA to evaluate the potential effects that V-RG baits may have on free-ranging raccoon populations (Hanlon et al. 1998). As a result of this field trial and subsequent trials elsewhere an effective V-RG has been developed to control species specific rabies variants to complement other methods of rabies prevention and control including public education, domestic animal vaccination, and human PEP. In 2005, APHIS-WS, in cooperation with the CDC, will begin conducting small mammal vaccinia monitoring at Parramore Island, VA. Because this is the site where vaccinia was first released into the wild in ORVAC baits and since these baits have not been released at this site since the early 1990s, viruses in hosts can be monitored. Microtine mammals, especially rodents, are typically the most likely hosts for orthopox viruses, which include vaccinia. Thus, these mammals are good sentinel species for indicators for the environmental presence of viruses, such as vaccinia. Samples will be collected and tested at CDC laboratories to determine the presence of vaccinia virus in small mammals collected at this site. Current plans involve conducting similar sampling and testing of small mammals at Plum Brook, OH in the near future for vaccinia surveillance.

Since the first field release of the V-RG vaccine in 1990, the number of vaccine-laden baits that were distributed annually in the U.S. has risen exponentially. For instance, APHIS-WS' involvement in the national rabies management program between 1995 and 2003 contributed to 43.75 million ORVAC baits disbursed in the U.S (USDA 2004c). Numerous projects have been conducted or are in progress in the eastern U.S. and Texas (USDA 2004a, 2004c). Since ORVAC program inception, positive rabies cases have either decreased or the advance of the virus has been slowed or stopped in each state where an ORVAC program was initiated:

- In Maryland, 18 rabies cases were reported per year on the Annapolis Peninsula alone before the ORVAC program began in 1998. From 2000-2002 and 2003, Maryland reported zero cases and one case, respectively (USDA 2004a, 2004c).

- In New York, an ORVAC program was implemented in 1998 to prevent the northward spread of the virus. Prior to the ORVAC program in New York, almost 150 positive rabies cases were recorded in 1998 and 1999. In 2002, New York reported a decline to 4 positive rabies cases, of which only one was attributed to a raccoon, and zero cases have been reported since (USDA 2004a, 2004c). A recently completed project in Albany and Rensselaer Counties of New York State demonstrated that raccoon rabies may be virtually eliminated from an area where the disease had been present for a number of years by use of ORVAC.

In late August, 2004, APHIS-WS initiated a cooperative emergency rabies surveillance and control program on Long Island (Nassau County) in cooperation with the New York State Department of Health (NYSDOH), Agriculture and Markets, Department of Environmental Conservation and the Nassau County Department of Health. The program included enhanced surveillance to better document the location and scope of a recent rabies outbreak and vaccination of raccoons to prevent the further spread of rabies. As a result of enhanced surveillance efforts, seven raccoons were confirmed to have the raccoon strain of rabies in Nassau County. More than 350 raccoons were trapped and submitted for testing within a 2 mile radius of the index case. This is the first time raccoon rabies has been documented on Long Island. Two types of vaccination programs were implemented in September, 2004 on Long Island by APHIS-WS and NYSDOH, including raccoon trap-vaccinate-release (more than 400 raccoons vaccinated) and ORVAC programs where 11,000 coated sachet baits were distributed by New York State police helicopters and 10,000 fishmeal polymer baits were distributed by hand in a zone around the positive cases. The contingency effort on Long Island focused on creating a rabies-immune raccoon population in the target zone to prevent additional cases. High densities of raccoons on Long Island make it more likely for a human, pet, or other domestic animal to encounter a rabid raccoon; thus the spread of raccoon rabies is of great concern. Enhanced surveillance and vaccination of raccoons will greatly decrease the chance of human and domestic animal contact with rabid raccoons (R. Chipman, APHIS-WS, pers. comm. 2004).

- In Vermont, before the program was started in 1996, positive rabies cases were found 73 km. (45.5 miles) south of the Quebec, Canada border. With an annual rate of spread of rabies at 56.3 km/year (35 miles/year), positive raccoon strain rabies cases should have reached the Canada border as early as 1999. However, the border has not yet been breached (USDA 2004a, 2004c). Annual vaccination projects in the Lake Champlain Valley in Vermont and New York have shown promise in preventing the northward spread of raccoon rabies. Raccoon rabies has moved through much of the St. Lawrence River Valley in northern New York with the appearance of two raccoon rabies foci (i.e., point locations of rabies cases) in southern Ontario. Cooperative efforts with Ontario and the implementation of point infection control strategies in Ontario around these foci are under evaluation to determine if the raccoon variant of the rabies virus can be contained and eliminated (L. Bigler, pers. comm. 2001).

- In Ohio, 62 positive rabies cases were recorded prior to program implementation in 1997. From 2001-2003, three cases were reported near the Pennsylvania border where raccoon rabies is still enzootic. In 2001, APHIS-WS, in coordination with state agencies, began an ORVAC program in Pennsylvania (USDA 2004a, 2004c) to address this issue. The ability to create rabies-free zones, within raccoon rabies enzootic areas, is a requisite to achieve elimination of this variant of the rabies virus.

  In mid-July 2004, a raccoon infected with raccoon variant of the rabies virus was confirmed just west of the ORVAC zone near Lake Erie in Lake County in northeastern Ohio. This cooperative ORVAC project began in 1997 and has expanded to include the states of Pennsylvania, West Virginia, Virginia, Tennessee, Maryland, Georgia and Alabama. Throughout its length from Ohio to northeastern Alabama, the ORVAC zone is at least 30-miles in width to attempt to prevent the westward spread of raccoon rabies. APHIS-WS and state, county and municipal cooperators responded immediately to this high priority rabies issue. A contingency action plan that included enhanced rabies surveillance, trap-vaccinate-release, and ORVAC was implemented upon detection of the index case. High raccoon population densities and additional rabies cases based on enhanced surveillance suggest that additional action may be required. Enhanced rabies surveillance is being maintained on the south and west sides of this outbreak to determine the next course of action, if required.

- In Massachusetts, the rabies virus had not spread to Cape Cod where intensive baiting programs at the peninsular neck (since 1995), combined with the natural barrier of Cape Cod Canal, seemed to act as effective barriers (Robbins et al. 1998). In early March 2004, however, raccoon variant of the rabies virus was confirmed east of the Cape Cod Canal for the first time. The canal served as the eastern anchor point for the ORVAC zone which was designed to prevent raccoon rabies from spreading east onto the Cape. This cooperative project was initiated in the mid-1990s by Tufts University and the State of Massachusetts Health Department. APHIS-WS became a partner in this effort in 2001. APHIS-WS, Tufts University, and the State of Massachusetts Health Department immediately implemented enhanced rabies surveillance, followed by trap-vaccinate-release, and ORVAC as a contingency action plan to prevent further spread, with the long range goal of eliminating raccoon

rabies from the area. It is not known if raccoon rabies spread to the Cape through the long range movement of an individual rabid raccoon, or skunk infected with raccoon variant of the rabies virus, or if the virus spread animal to animal approaching the canal, with rabies spreading to the Cape through a short range raccoon or skunk movement across the canal. Translocation, either intentional or unintentional (i.e., raccoon "hitch-hiking" in a garbage truck or tailored boat and escaping once on the Cape), represents another other potential source of spread.

- In June 2003, the rabies front, which had stalled in North Carolina, finally moved west and crossed over the Appalachians into upper east Tennessee (6 raccoon strain cases were reported). In attempt to stay ahead of the rabies front, APHIS-WS extended the ORVAC baiting area into Tennessee (USDA 2004a, 2004c).

- Since 1995, 9.35 million vaccine-laden baits have been distributed in south Texas in an ORVAC program that has proved to be highly effective in the elimination of the coyote rabies strain in that area. Prior to the ORVAC program, 166 canine strain rabies cases were reported in Texas. One case was reported in 2001 along the Texas-Mexico border and zero cases have been reported since. Similar success is sought in the gray fox epizootic in west-central Texas where 10.6 million vaccine-laden baits have been distributed. In 2002, 18 positive cases of gray fox strain rabies occurred outside the barrier, possibly due to an interrupted baiting program in 2000 and 2001 as a result of a lack of funding. Increased funding was provided for the 2003 gray fox ORVAC program in Texas in order to encircle the zone where positive cases have been reported and blanket the area (USDA 2004a, 2004c).

- Projects have also been conducted or are in progress in New Jersey (2003-present), Florida (1995-present), Virginia (2000-present), West Virginia (2001-present), Pennsylvania (1995-present), New Hampshire (2002-present), Alabama (2003-present), Georgia (2003-present), Maine (2003-present), Kentucky (2003-present), Louisiana (2003-present), and Mississippi (2003-present).

The challenge for successful elimination of raccoon rabies in the U.S. involves cooperation by numerous states and land managers. Single states within the larger enzootic zones cannot proceed with elimination programs in isolation. Re-invasion from neighboring states will always be a risk unless all programs are coordinated carefully. In Germany, elimination of fox rabies has progressed slowly, at least partly because the individual states did not act in concert. In France, which had a national program, elimination occurred within 5 years. The challenge in North America concerning raccoon rabies is to achieve cooperation and coordination between two or more levels of government in two countries (MacInnes and LeBer 2000). The use of oral vaccination in Switzerland during the past 20 years resulted in a declaration of rabies-free status in 1998. A similar declaration was made by France as of the end of 2000 (Krebs et al. 2002).

1.2 DESCRIPTION AND PURPOSE OF THE PROPOSED PROGRAM

The proposed program would distribute ORVAC baits on several NPS units located in thirteen states (GA, ME, MD, MA, NH, NJ, NY, NC, PA, TN, VT, VA, and WV) within the Northeast Region of The U.S. Department of the Interior (USDI), National Park Service (NPS). The NPS units that could potentially be affected include several of the Northeast Region's Mid-Atlantic Network Parks:

- Appalachian National Scenic Trail, GA to ME[3]
- Eisenhower National Historic Site, PA
- Gettysburg National Military Park, PA
- Appomatox Courthouse National Historical Park, VA
- Booker T. Washington National Monument, VA
- Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park, VA
- Petersburg National Battlefield, VA
- Richmond National Battlefield Park, VA
- Shenandoah National Park, VA

[3] Approximately 100,000 acres of the Appalachian National Scenic Trail are administered by the NPS. The other portion of the trail is managed by various federal, state, and local agencies. The NPS would only have authority to conduct ORVAC activities on NPS-administered lands.

The networks, or groupings of parks, were established by the NPS to monitor ecological communities in its parks. The broad-based scientifically sound information obtained through long term natural resource monitoring will have multiple applications for management decision-making, research, education, and promoting public understanding of park resources (http://www1.nature.nps.gov/protectingrestoring/im/inventoryand monitoring.htm). The four networks found in the Northeast Region of the NPS are the Eastern Rivers and Mountains, Mid-Atlantic, Northeast Temperate, and Northeast Coastal and Barrier (Figure 1-3). The parks included in each of these networks are found in similar ecological communities, but are not necessarily close together. The NPS determined these networks should also be used to group parks for the purposes of implementing the ORVAC program.

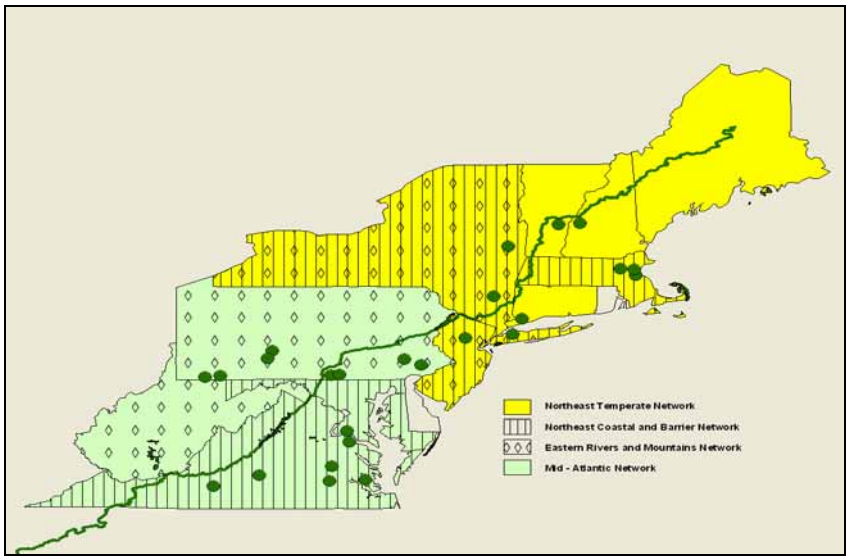

Figure 1-3. The Network Parks system in the NE Region of the NPS. (solid green line = Appalachian National Scenic Trail).

The inclusion of land areas managed by the federal government has become an increasingly important requirement for this program, given the extensive public lands within the ORVAC targeted zones (J.P. Koplan, M.D., Director, CDC, pers. comm. 2001). Therefore, participation by these NPS units is necessary to support and cooperate with the involved state agencies and the USDA, APHIS-Wildlife Services (APHIS-WS) in their ongoing efforts of eliminating or stopping the westward and northward spread of raccoon rabies in the eastern U.S. and in reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans by approving ORVAC programs on NPS-managed lands. Currently, cooperative rabies vaccination programs are already being conducted on various land classes in each of the aforementioned states in addition to numerous other states in the eastern U.S. (Figure 1-4). By participating, the NPS would aid in enhancing the effectiveness of the national program. If baiting programs were conducted around these large land masses, reservoirs of the virus would likely still exist, creating holes in the program and potentially making the program less effective at stopping the forward advance or eliminating the raccoon strain of the rabies virus.

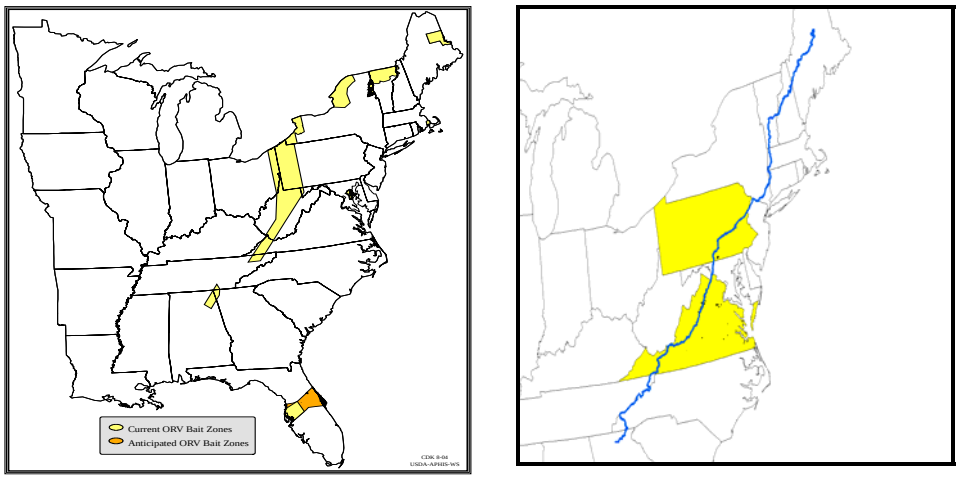

Figure 1-4 A and B. A (Left): Current oral rabies vaccination barrier zones in the U.S. B (Right): ORVAC baits would be distributed on NPS units (green) within the states shaded in yellow under the proposed action to vaccinate wild raccoons and form barriers to halt further spread of the disease.

Currently, the rabies management program has no plans to implement an ORVAC program on many of the NPS units listed in the proposed action. However, as a result of the potential for outbreaks such as the current outbreak in positive raccoon strain rabies cases on Long Island and recent breaches of positive raccoon strain rabies past the ORVAC barrier in OH and Cape Cod, MA, it is important to include all park units that could potentially be baited in this EA. If the park units are included now, the national rabies program will be prepared to bait if/when an emergency situation or outbreak occurs that threatens public safety. For the national rabies program to be effective, advance preparation and proactiveness is essential for dealing with the possibility of outbreaks by implementing contingency actions in the event of a public health threat.

The Contingency Action Planning Team, part of the Rabies Management Team, has evaluated practical alternatives to address rabies threats that may compromise the integrity of ORVAC efforts. The team is finalizing contingency action recommendations that may be taken if any of the following occur (Slate et al. 2002):

- rabies intensifies approaching an immune barrier
- "hot spots" occur within a barrier
- rabies breaches a barrier, but is detected just beyond the vaccination zone
- rabies occurs as an isolated focus sufficiently distant from a barrier to suggest translocation, intentional or unintentional, was the source of the focus (such as with the current Long Island outbreak that was likely caused by "hitch-hiking" raccoons in garbage trucks using a landfill in the area).

Potential areas involved may cover several land types and land uses, including: forests, meadows, wetlands, and rangelands representing diverse wildlife habitats. The program would involve the distribution of ORVAC baits to create zones of vaccinated target species that would then serve as barriers to cease the further advancement of raccoon rabies virus variants. Vaccination zones would be determined in cooperation with several state rabies task forces and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve the use of APHIS-WS federal funds to purchase and distribute ORVAC baits.

Despite ongoing programs, the first case of raccoon rabies was confirmed in Ontario, Canada, during July 1999. Ontario does not want raccoon rabies and is working jointly with the U.S. to eliminate existing reservoirs of the raccoon variant of the rabies virus and prevent the spread of this disease into and within Canada. Efforts are underway to prevent the disease from becoming enzootic in this province (Rosatte 2000). The national rabies management program is dedicated to preventing additional cases from moving northward into Canada, in addition to preventing the westward spread of the virus. Efforts to build an "immune barrier" along the border of western Pennsylvania and eastern Ohio have shown very positive signs. In 1997, the epizootic year for Ohio, 62 raccoon rabies case were report to State officials. After four years of baiting, zero cases of raccoon rabies were reported in

2000. The rabies has not been eliminated, but the number of raccoons carrying the virus has been greatly decreased. With the successful establishment of the immune barrier in eastern Ohio, APHIS-WS will be slowly moving the "barrier" east into Pennsylvania, West Virginia, Virginia, Maryland, and New York. The movement of the barrier will be slow and carefully measured to make sure that rabies activities are declining before moving the barrier. With generally successful results achieved with baiting for rabies along the western front, similar results are hopeful along the U.S. and Canada border.

The ORVAC that would be used is the V-RG vaccine. V-RG vaccine is approved by USDA, APHIS, VS, Center of Veterinary Biologics for use on raccoons in the U.S. and Canada. The V-RG vaccine would be encased in fishmeal type baits. The baits weigh approximately 1 ounce and measure 11/4 x 11/4 x 3/4 inches. When an animal finds and ingests the bait, it receives a single dose of the vaccine. Each individual bait would have a warning label advising persons not to handle or disturb the bait along with a toll-free telephone number to call for further information. Individual baits may contain a non-toxic biomarker (e.g., tetracycline) (Johnston et al. 1987, USDA 1991). This biomarker is used to aid in determining whether animals have eaten one or more baits for the purpose of monitoring project effectiveness within and outside the established ORVAC barrier zones. Each state ORVAC program collects wild animals for monitoring purposes throughout the involved state (USDA 2001a). However, these state programs have determined that it would not be necessary to collect wild animals for monitoring purposes on NPS units. Therefore, no wild animals will be collected from the aforementioned NPS units for monitoring purposes. The NPS will use monitoring data collected by the various state ORVAC programs on non-NPS lands surrounding the parks to determine if program goals have been met.

On an annual basis, one treatment of ORVAC baits could be distributed by aircraft (fixed-wing airplane or helicopter) and ground placement on the NPS units (see list in Section 1.2). The need to distribute baits on each of the park units would be assessed annually and based on the most current distribution of rabies cases and the expected direction of disease spread. The annual treatment would continue on a reoccurring basis until the goals of the ORVAC program have been met. Baits would be distributed at an average density of 75 per square km during the spring and/or fall months (February 1-May 31 and/or August 15 to November 30). Air drops would be typically conducted at about 500 feet above ground level and would only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. ORVAC baits would not be aerially distributed in areas that are frequently used by a high volume of park visitors (i.e., visitor centers, campgrounds, etc.), as well as over lakes, reservoirs, and large rivers. Aerial distribution of baits would primarily target areas of habitat suitable for the target species. When aerial distribution by fixed-wing or helicopter aircraft is not practical, baits would be distributed by careful hand placement to help to minimize contact by humans, pets and other domestic animals.

The proposed ORVAC program would be conducted in compliance with appropriate federal, state and local laws including National Park Service Management Policies 2001, Director's Orders, executive orders, general environmental legislation, and other laws used to guide management practices carried out on NPS lands.

1.3 NEED FOR ACTION

1.3.1 Need for a Raccoon ORVAC Program

If new rabies strains such as those transmitted by raccoons are not prevented from spreading to new areas of the U.S., the health threats and costs associated with rabies are expected to increase substantially as broader geographic areas are affected.

Need to protect human health and safety
People are concerned with potential health threats and costs associated with being exposed to a rabid animal. People are most often exposed through a bite from a wild or domestic animal infected with the disease (CDC 2001a). More than 90 percent of all reported animal cases occur in wild animals (CDC 2001a). Rabies is a fatal disease in humans unless medically treated with postexposure prophylaxis. Human health care concerns associated with the disease would be expected to increase as the rabies virus infects a much broader geographic area. Expansion of ORVAC activities to include NPS units is important for providing adequate coverage to the barrier and other outbreak areas in order to retain program effectiveness. A more detailed description of the need to protect humans from exposure to the rabies virus is presented in Section 1.1.2 of this environmental assessment (EA).

Need to protect domestic animals
In the area that stretches west from the leading edge of the current distribution of raccoon rabies (which stretches from Alabama northeastward along the Appalachian Mountains through coastal Maine) to the Rocky Mountains, there are more than 111 million livestock animals, including cattle, horses, mules, swine, goats, and sheep, valued at $42 billion (65 FR 76606-76607, December 7, 2000). Also within this area are countless numbers of domestic animals that are kept by people as pets (cats, dogs, rabbits, ferrets, etc). If raccoon rabies were to spread into the above described area, many of these domestic animals would be at risk of being exposed to this specific variant.

1.4 AUTHORITIES

Federal Authorities

National Park Service Organic Act - Act of August 25, 1916 (16 U.S.C. 1, 2, 3, and 4) and Management Policies. By enacting the National Park Service Organic Act of 1916 (Organic Act), Congress directed the USDI and the NPS to manage units "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1). Congress reiterated this mandate in the **Redwood National Park Expansion Act of 1978** by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1).

Despite these mandates, the Organic Act and its amendments afford the NPS latitude when making resource decisions that balance visitor recreation and resource preservation. By these acts Congress "empowered [the NPS] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use" (*Bicycle Trails Council of Marin v. Babbitt*, 82 F.3d 1445, 1453 (9th Cir. 1996)).

Yet, courts consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor recreation. *Michigan United Conservation Clubs v. Lujan*, 949 F.2d 202, 206 (6th Cir. 1991) states, "Congress placed specific emphasis on conservation." The *National Rifle Ass'n of America v. Potter*, 628 F. Supp. 903, 909 states, "In the Organic Act Congress speaks of but a single purpose, namely, conservation." The NPS *Management Policies 2001* (USDI 2000b) also recognize that resource conservation takes precedence over visitor recreation. The policy dictates "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant" (NPS *Management Policies 2001*, sec. 1.4.3).

Because conservation remains predominant, the NPS seeks to avoid or to minimize adverse impacts on park resources and values. Yet, the NPS has discretion to allow negative impacts when necessary (NPS *Management Policies 2001*, sec. 1.4.3). While some actions and activities cause impacts, the NPS cannot allow an adverse impact that constitutes a resource impairment (NPS *Management Policies 2001*, sec. 1.4.3). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the actions (16 USC 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS *Management Policies 2001*, sec. 1.4.4). To determine impairment, the NPS must evaluate "the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (NPS *Management Policies 2001*, sec. 1.4.4).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary as well. An action appropriate in one unit could impair resources in another unit. Thus, this EA analyzes the context, duration, and intensity of impacts related to an oral rabies vaccination program at the following NPS units:

- Appalachian National Scenic Trail, GA to ME

- Eisenhower National Historic Site, PA
- Gettysburg National Military Park, PA
- Appomatox Courthouse National Historical Park, VA
- Booker T. Washington National Monument, VA
- Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park, VA
- Petersburg National Battlefield, VA
- Richmond National Battlefield Park, VA
- Shenandoah National Park, VA

as well as potential for resource impairment, as required by NPS *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making (DO-12).*

Act of 1968. Appalachian National Scenic Trail was established as the first National Scenic Trail by Congress with passage of the National Trails System Act in 1968 and amendments. The Appalachian National Scenic Trail is administered primarily as a footpath in cooperation with the USDA-Forest Service and the 14 states encompassing the trail. This trail provides for maximum outdoor recreation potential as an extended trail and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which the trail passes.

Act of November 27, 1967 (33.F.R.16031). Eisenhower National Historic Site was established on November 27, 1967 to protect and preserve the resources associated with Eisenhower National Historic Site in order to promote understanding and appreciation of the life, work, and times of Dwight David Eisenhower.

Act of February 11, 1895 (28 Stat.651). Gettysburg National Military Park was established by an Act of Congress on February 11, 1895 to preserve and protect the resources associated with the Battle of Gettysburg and the Soldier's National Cemetery, and to provide understanding of the events that occurred here, within the context of American history.

Act of August 13, 1935. Appomatox Courthouse National historical Park was established by Congress on August 13, 1935 to commemorate the end of the Civil War and further public understanding of the specific historic events that occurred here.

Public Law 84-464 (16 U.S.C. 45011). Booker T. Washington National Monument was authorized on April 2, 1956 by Public Law and became a reality in June 1957 by Presidential Proclamation. This park preserves and protects the birth site and childhood home of Booker T. Washington while interpreting his life experiences and significance in American history as the most influential African American between 1895 and 1915.

Act of February 14, 1927. Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park was established on February 14, 1927 to protect and preserve the resources associated with the Civil War battles of Fredericksburg, Chancellorsville, Wilderness, and Spotsylvania.

Act of July 3, 1926 (44 Stat. 822). Petersburg National Battlefield was established by an Act of Congress on July 3, 1926 to commemorate the campaign and siege and defense of Petersburg, VA, in 1864 and 1865. This national battlefield preserves for historical purposes the breastworks, earthworks, walls, or other defenses or shelters used by the armies therein.

March 2, 1936 (49 Stat. 1155). Richmond National Battlefield Park was authorized by Congress on March 2, 1936 to protect the Civil War battlefield resources associated with the struggle for the capital of the Confederacy and to interpret these resources so as to foster an understanding of their larger significance.

Act of 1935. Shenandoah National Park was established by Congress in December, 1935 to protect the natural and cultural resources of the northern Blue Ridge and immediate area. Shenandoah Wilderness was designated on October 20, 1976 and Sky-line Drive was placed on the National Register of Historic Places in 1996.

State Authorities

Each of the states involved in this proposed action has a state agency or agencies with authority under state law to approve, conduct or coordinate rabies control programs. NPS involvement in rabies control in each state would only occur in complete cooperation with the appropriate state agency(ies) and in accordance with state authorities as identified by those agencies.

Georgia Department of Natural Resources (Official Code of GA Annotated: Title 12 – Conservation and Natural Resources and Title 27 – Game and Fish). The Department of Natural Resources is authorized to sustain, enhance, protect, and conserve Georgia's natural, historic, and cultural resources for present and future generations, while recognizing the importance of promoting the development of commerce and industry that utilize sound environmental practices.

Georgia Department of Agriculture (Official Code of GA Annotated: 4-9-1 through 4-9-9). The Georgia Department of Agriculture is authorized to ensure an abundance of safe food and fiber for Georgia, America and the world.

Georgia Department of Human Resources, Division of Public Health (Official Code of GA Annotated: Title 31; Chapter 19, Section 2). The GA Department of Human Resources issued a Declaration to Protect the Public Health in October 1, 2003 to control the spread of the raccoon strain of the rabies virus in four counties within GA within the Northwest Georgia Health District.

Maine Department of Human Services - Maine State Health and Environmental Testing Laboratory/Epidemiology Program (22MRSA, Subtitle 2, Part 2, Chapter 157-A, Section 565). The ME State Health and Environmental Testing Laboratory/Epidemiology Program is authorized to offer the direct fluorescent antibody (DFA) for the rapid and accurate diagnosis of rabies in a suspect animal using brain tissue. The diagnosis of the presence or absence of rabies can be used as a guide for medical recommendations for humans or domestic animals who are at risk of exposure.

Maine Department of Inland Fisheries and Wildlife (22MRSA, Subtitle 2, Part 3, Chapter 251, Section 1313). The ME Department of Inland Fisheries and Wildlife is authorized to provide for or pay all necessary costs for transportation and euthanasia of an undomesticated animal suspected of having rabies.

Maine State Department of Agriculture (7MRSA, part 1, Chapter 1, Section 1-B). The ME State Department of Agriculture has the authority to implement the rules and regulations for rabies throughout ME. State veterinarians dispense the rabies vaccination to livestock, enforce quarantines, and regulate animal transportation in and out of Maine's borders.

Maryland Department of Health and Mental Hygiene (MD Code: Title 18, Subtitle 3, §18-313). The MD Department of Health and Mental Hygiene shall provide a statewide system to: 1) control rabies; 2) to grant authority to the public health veterinarian and the local health officer in matters pertaining to the disposition of animals that bite or otherwise expose rabies to an individual; 3) to assist local political subdivisions regarding the laboratory testing of rabid animals; 4) to treat each individual who is exposed or suspected of having been exposed to rabies; 5) to distribute the biological products that are needed to prevent and treat rabies.

Maryland Department of Natural Resources (MD Code: Title 10, Subtitle 2, §10-202). The MD Department of Natural Resources is responsible for conservation and management of wildlife and wildlife resources of the state.

Massachusetts Department of Public Health (MA Code: 105CMR). The MA Department of Public Health is dedicated to protecting, preserving, and improving the health of all the Commonwealth's residents.

Massachusetts Department of Fish and Game, Division of Fisheries and Wildlife (MA Code: 321CMR). The MA Division of Fisheries and Wildlife works to protect the public & wildlife by: 1)monitoring outbreaks of wildlife disease; 2) sharing information with humane and animal health authorities; 3) prohibiting possession of wildlife as pets; 4) regulating wildlife populations through harvest of animals by licensed hunters and trappers; 5) prohibiting the importation or relocation of wildlife; and 6) increasing public awareness of wildlife through education.

Massachusetts Department of Agricultural Resources (MA Code: 330 CMR). The MA Department of Agricultural Resources deals with the prevention and the spread of rabies in humans and domestic animals.

New Hampshire Department of Agriculture, Markets, and Food (NH Revised Statutes Annotated: Title XL; Chapter 436-A; Section 436-A:1). The state veterinarian within the NH Department of Agriculture, Markets, and Food may authorize the application of vaccines and treatments for zoonotic diseases to wildlife within the state through baiting or other methods.

New Hampshire Fish and Game Department (NH Revised Statutes Annotated: Title XVIII; Chapter 206; Section 206:10:I). The NH Fish and Game Department is charged with protecting, propagating and preserving the fish, game and wildlife resources of NH and protecting and conserving nongame birds of NH.

New Jersey Department of Environmental Protection, Division of Fish and Wildlife (NJDFW). The mission of the NJDFW is to protect and manage NJ's fish and wildlife to maximize their long-term biological, recreational, and economic values for NJ's residents.

New Jersey Department of Agriculture (NJDA). The mission of the NJDA is to develop, promote, conserve, and support the agriculture and agribusiness industry of the state and those natural and renewable resources that are associated with agriculture and other open lands for the benefit of all its citizens.

New Jersey Department of Health and Senior Services (NJDHSS). The NJDHSS provides guidance on public health related issues and potential health problems associated with wildlife.

New York State Agriculture and Markets (NY Legislative Authorization Code: Chapter 69, Article 5, Section 73b). NY State Agriculture and Markets is authorized to establish a NY State Veterinary Diagnostic Laboratory (**Cornell University** works under this law during ORVAC program participation) which is authorized to respond to disease outbreaks in animals; establish diagnostic testing capabilities to establish heard health status and evaluation of disease programs; support disease surveillance and monitoring programs of domestic, zoo, and wild animals; support veterinarians by analyzing and interpreting samples obtained from clinical cases; and evaluate, adjust, and improve NY's ability to recognize diseases that impact animal populations. **(NY Legislative Authorization Code: Chapter 69, Article 5, Section 72).** The NY State Department of Agriculture and Markets is authorized to investigate, suppress, or eradicate infectious or communicable disease affecting domestic animals or carried by domestic animals and affecting humans. Measures shall be taken to prevent such disease from being brought into the state or suppress or prevent the disease from spreading within the state.

New York Department of Environmental Conservation (NY Legislative Authorization Code: Chapter 43-B, Article 11, Title 3, Section 11-0325 and 11-0525). The NY Department of Environmental Conservation is authorized to undertake fish or wildlife control measures to eliminate, reduce, or confine a disease which endangers the health and welfare of fish or wildlife populations. The NY Department of Environmental Conservation is directed to undertake through the use of professional trappers or by other means wildlife control measures when rabies is certified to exist in an area of the state in attempt to eliminate, reduce, or confine the disease.

New York State Department of Health (NY Legislative Authorization Code: Chapter 45, Article 2, Section 201). The NY State Department of Health is directed to supervise the reporting and control of disease and promote education in the prevention and control of disease.

North Carolina Wildlife Resources Commission (North Carolina General Statute 113-131). The NC Wildlife Resource Commission is charged with the stewardship of wildlife resources.

North Carolina Department of Agriculture and Consumer Services (North Carolina General Statute 113-3). The NC Department of Agriculture focuses of providing animal disease programs designed to control and eliminate animal diseases and ensure general animal health.

North Carolina Department of Environment and Natural Resources (North Carolina General Statute 113-3). The NC Department of Environment and Natural Resources is the lead stewardship agency for the preservation and protection of North Carolina's outstanding natural resources.

North Carolina Department of Health and Human Services (North Carolina General Statute 130A-1.1). The NC Department of Health and Human Services is authorized to provide efficient services that enhance the quality of life of North Carolina individuals and families so that they have opportunities for healthier and safer lives resulting ultimately in the achievement of economic and personal independence.

Pennsylvania Game Commission (Law 322 (a) Title 34). The PA Game Commission is charged to protect, propagate, manage, and preserve the game or wildlife of this Commonwealth and to enforce, by proper actions and proceedings, the law of this Commonwealth relating thereto.

Pennsylvania Department of Agriculture (PA Agriculture Code: Chapter 23; Section 2327 (d)). The PA Department of Agriculture is authorized to solicit assistance from and provide assistance to federal and other state agencies, local governments and private entities in monitoring wild animals in this Commonwealth to determine the presence of dangerous transmissible diseases.

Pennsylvania Department of Health (PA Administrative Code: Chapter 532; Section 2102 (a)). The PA Department of Health is authorized to protect the health of the people of this Commonwealth and to determine and employ the most efficient and practical means for the prevention and suppression of disease.

New Hampshire Department of Health and Human Services (NH Revised Statutes Annotated: Title X; Chapter 125; Section 125:9:II). The NH Department of Health and Human Services is authorized to make investigations and inquiries concerning the causes of epidemics and other diseases, the sources of morbidity and mortality, and the effects of localities, employments, conditions, circumstances, and the environment on the public health. Investigations also include an extended rabies surveillance effort which shall be conducted with assistance from the NH Department of Agriculture, Markets, and Food; and NH Fish and Game Department.

Tennessee Wildlife Resources Agency (Tennessee Coe Annotated: Title 70; Chapters 1-8). The TN Wildlife Resources Agency is authorized to protect, propagate, increase, preserve, and conserve the wildlife of this state, and enforce by proper action and proceedings, the existing laws.

Tennessee Department of Health (Tennessee Code Annotated: Title 68, Chapter 8). The TN Department of Health works to promote, protect, and improve the heath and well-being of the people of Tennessee. It provides public health services not available from other sources, such as rabies testing. It also conducts environmental surveys in schools and child care facilities and monitors rabies control.

Tennessee Department of Agriculture (Tennessee Code Annotated: Title 44, Chapters 1-20). The TN Department of Agriculture's mission is to serve the citizens of Tennessee by promoting wise uses of Tennessee's agricultural and forest resources, developing economic opportunities, and ensuring safe and dependable food and fiber.

Vermont Department of Health (VT Statutes Annotated: Title 18; Chapter 1). The VT Department of Health is authorized to promote health and safety, and prevent disease.

Vermont Agency of Agriculture, Food, and Markets (VT Statutes Annotated: Title 6; Chapter 102; §1152). The VT Agency of Agriculture, Food, and Markets may contract and cooperate with the USDA and other federal agencies or other states for the control and eradication of contagious diseases of animals. (VT Statutes Annotated: Title 6; Chapter 102; §1151, "contagious disease" includes rabies).

Vermont Department of Fish and Wildlife (VT Statutes Annotated: Title 10; Chapter 103). The VT Department of Fish and Wildlife is charged with conservation of fish, wildlife, and plants and their habitats for the people of VT.

Virginia Department of Health (Code of Virginia: Section 32.1.42). The VA Department of Health is authorized to control human disease and diseases in wildlife that threaten public health.

Virginia Department of Game and Inland Fisheries (Code of Virginia: Title 29.1). The VA Department of

Game and Inland Fisheries is authorized to manage VA's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth; to provide opportunity for all to enjoy wildlife, inland fish, boating, and related outdoor recreation; to promote safety for persons and property in connection with boating, hunting, and fishing.

West Virginia Department of Agriculture (WV Code of State Regulations Section §19-9-2A). The WV Department of Agriculture is charged with prevention, suppression, control, and eradication of any communicable disease of animals or poultry.

West Virginia Department of Health and Human Resources (WV Code of State Regulations Chapter 16, Section §16-2-11 (a)(1)(iii)). Chapter 16 of the WV Department of Health and Human Resources authorizes the creation of a state public health system, including local boards of health, whose duties include "prevention and control of rabies."

West Virginia Division of Natural Resources (WV Code of State Regulations Section §20-2-1). The WV Division of Natural Resources is charged with protecting the wildlife resources for the use and enjoyment of all the citizens in WV.

1.5 OTHER RELEVANT FEDERAL LAWS AND REGULATIONS

National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.). NPS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA is intended to meet the NEPA requirement for the proposed action by clearly communicating the scope of federal involvement and by determining if there are any substantive new issues or alternatives that should be analyzed.
ORVAC activities described under the proposed action do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.). It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). For actions that "may affect" listed species, NPS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)).

National Historical Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470). The NHPA and its Implementing regulations (36 CFR 800) require federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings.

Wilderness Act of 1964 – An Act (Public Law 88-577; 88th Congress, S.4; September 3, 1964). The Wilderness Act allows federally owned lands meeting specific criteria to be designated as "wilderness areas." The act prohibits and restricts certain uses of these designated lands. The act provides special provisions to allow certain activities to take place within designated wilderness areas such as the use of aircraft to control fire, insects and diseases (Sec. 4 (d)).

Clean Air Act of 1970 as amended (42 U.S.C. 7401). The Clean Air Act is a comprehensive federal law that regulates air emissions from area, stationary, and mobile sources.

1.6 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

NPS PLANS

NPS Management Policies 2001 (USDI 2000b). This manual provides guidance on enhancing visitor safety (Section 8.2.5.1), which directly relates to this proposed project. The expanding epidemic of raccoon rabies in the eastern U.S. is considered a public health emergency (Clark and Wilson 1995) and is therefore considered under the visitor safety section of the manual. The proposed project is, therefore, consistent with the NPS *Management Policies 2001* manual. Additionally, NPS personnel reviewed the appropriate plans (i.e., strategic, general management, and resource management plans) for individual park units. There are no conflicts between the proposed action and any existing park plans. The proposed action is consistent with national guidance.

- **Appalachian National Scenic Trail**
  - **Comprehensive Plan (1981, updated 1987).** This plan was prepared under the authority contained in the National Trails System Act and describes the plan for management of the Appalachian National Scenic Trail.
  - **Strategic Plan (2000).** This plan contains long-term goals that describe in quantified, measurable ways examples of what the NPS plans to achieve in the five-year period covered by this plan, October 1, 2000 through September 30, 2005, federal fiscal years (FY) 2001-2005.

- **Eisenhower National Historic Site**
  - **General Management Plan (1987).** This plan outlines methods to preserve the cultural and natural resources of the site in a manner that gives the appearance of the 1950-1969 era; to interpret the Eisenhowers and their lives at Gettysburg through their home and farm activities including the pre-presidential, presidential, and retirement years; to cooperate with a variety of other governmental interests, individuals, and institutions in order to promote the site's preservation and improve the interpretive experience for the visitor.
  - **Strategic Plan (2000).** This plan contains long-term goals that describe in quantified, measurable ways intended achievements of the six-year period (2000-2005).
  - **Resource Management Plan (1997).** This plan is a working document. It contains a description of the current programs for managing the park's natural and cultural resources, provides an evaluation of those programs, identifies significant inadequacies in both preservation activities and knowledge, analyzes alternatives for solving those inadequacies, and proposes a prioritized program with cost estimates to correct the most important of these problems.

- **Gettysburg National Military Park**
  - **General Management Plan and Environmental Impact Statement (1999).** This purpose of this plan is to set forth a basic management philosophy for a park to provide a framework for future desionmaking. This plan, therefore, provides guidance for stewardship and interpretation of the park's three nationally significant landscapes.
  - **Strategic Plan (2000).** This plan contains long-term goals that describe in quantified, measurable ways intended achievements of the six-year period (2000-2005).
  - **Resource Management Plan (1994).** This plan is a working document. It contains a description of the current programs for managing the park's natural and cultural resources, provides an evaluation of those programs, identifies significant inadequacies in both preservation activities and knowledge, analyzes alternatives for solving those inadequacies, and proposes a prioritized program with cost estimates to correct the most important of these problems.

- **Appomatox Courthouse National Historical Park**
  - **Strategic Plan (2000).** This plan contains long-term goals that describe in quantified, measurable ways examples of what the NPS plans to achieve in the five-year period covered by this plan, October 1, 2000 through September 30, 2005, federal fiscal years (FY) 2001-2005.

- **Booker T. Washington National Monument**
  - **General Management Plan, Environmental Impact Statement (2000).** This plan describes and analyzes the preferred alternative for the management and use of the Booker T. Washington National Monument.
  - **Resource Management Plan (1999).** This plan outlines significant resources associated with the Booker T. Washington National Monument that will be protected and restored as appropriate.

- **Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park**
  - **General Management Plan (1986).** This plan outlines resources management and land protection recommendations that will be implemented to preserve and protect the park setting.
  - **Resources Management Plan (1999).** This plan discusses the manipulation of natural resources to enhance the interpretation of historic values, especially battlefield landscapes.

- **Petersburg National Battlefield**
  - **Strategic Plan (2000).** This plan contains long-term goals that describe in quantified, measurable ways examples of what the NPS plans to achieve in the six-year period covered by this plan, October 1, 2000 through September 30, 2005, federal fiscal years FY2001-2005.
  - **Annual Performance Plan (2004).** This plan focuses on the FY 2004 goals within the Strategic Plan and what the NPS hopes to achieve in FY 2004.

- **Richmond National Battlefield Park**
  - **General Management Plan and Environmental Impact Statement (1996).** This plan presents and proposal and three alternatives for the management, use, and development of Richmond National Battlefield Park.
  - **Resources Management Plan (1999).** This plan outlines significant resources associated with the Richmond National Battlefield Park that will be protected and restored as appropriate.
  - **Strategic Plan (2000).** This plan contains long-term goals that describe in quantified, measurable ways examples of what the NPS plans to achieve in the six-year period covered by this plan, October 1, 2000 through September 30, 2005, federal fiscal years FY2001-2005.

- **Shenandoah National Park**
  - **Strategic Plan (2000).** This plan contains long-term goals that describe in quantified, measurable ways examples of what the NPS plans to achieve in the six-year period covered by this plan, October 1, 2000 through September 30, 2005, federal fiscal years FY2001-2005.
  - **Annual Performance Plan (2002).** This plan covers FY 2003, one year of the five-year Strategic Plan period. It focuses on annual goals at Shenandoah National Park for 2003.

NEPA DOCUMENTS

A number of other NEPA documents have been prepared that analyzed the potential environmental effects of ORVAC programs. Pertinent information from those analyses has been incorporated by reference into this EA.

APHIS-WS Programmatic EIS. APHIS-WS has issued a final Environmental Impact Statement (EIS) (USDA 1997) and Record of Decision on the National APHIS-WS program.

EA and Finding of No Significant Impact – Oral Rabies Vaccination Program. This EA (USDI 2004a) and Decision/Finding of No Significant Impact (FONSI), dated June 28, 2004, analyzed the environmental effects of NPS participation in ORVAC programs on fifteen NPS units in the states of Alabama, Florida, Georgia, North Carolina, and Tennessee in the effort of stopping the spread of a specific raccoon rabies variant or "strain" of the rabies virus and reducing or eliminating this strain of the virus from the eastern United States. The NPS determined the action would have a negligible impact on the quality of the human environment.

EA and Finding of No Significant Impact – Oral Rabies Vaccination Program for Big Bend National Park, Guadalupe Mountains National Park, and Amistad National Recreation Area in Texas. This EA (USDI 2003) and Decision/Finding of No Significant Impact (FONSI), dated June 13, 2003, analyzed the environmental effects of

NPS participation in ORVAC programs to eliminate or stop the spread of gray fox rabies on three NPS units in Texas. The NPS determined the action would have a negligible impact on the quality of the human environment.

EA and Finding of No Significant Impact – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the United States. This EA (USDA 2001a) and Decision/FONSI (2001b), dated July 30, 2001; a supplemental Decision/FONSI, dated August 5, 2002 (USDA 2002); a supplemental EA (USDA 2003a) and Decision/FONSI (USDA 2003b), dated June 12, 2003; and the most recent supplemental EA (USDA 2004d) and Decision/FONSI, dated September 9, 2004 (USDA 2004e) analyzed the environmental effects of APHIS-WS involvement in the funding of and participation in ORVAC programs to eliminate or stop the spread of raccoon rabies in 25 eastern states (Alabama, Connecticut, Delaware, Florida, Georgia, Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, and West Virginia) plus the District of Columbia and gray fox and coyote rabies in Texas. APHIS-WS determined the action would have a negligible adverse impact on the quality of the human environment.

EA and Finding of No Significant Impact - Oral vaccination to Control specific rabies virus variant in raccoons on National Forest System lands in the United States. This EA (USDA 2004c) and FONSI, dated February 12, 2004, analyzed the potential environmental effects of a proposal to expand the involvement of the APHIS-WS program in ORVAC programs to portions of National Forest System lands, excluding Wilderness Areas, in a number of eastern states. The National Forest System lands where APHIS-WS involvement would be expanded may be located within the states of Alabama, Georgia, Florida, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, and West Virginia. Numerous National Forest System lands are located within current and potential ORVAC barrier zones. To effectively combat this strain of the rabies virus, it has become increasingly important to bait these large land masses.

EA and Finding of No Significant Impact – Proposed Issuance of a Conditional United States Veterinary Biological Product License to Rhone Merieux, Inc., for Rabies Vaccine, Live Vaccinia Vector. This EA and its FONSI dated April 7, 1995 was prepared by APHIS and concluded there would be no significant impact on the quality of the human environment from the decision to issue the conditional license referred to above (USDA 1995a). The conditional license approved the use of V-RG in raccoon rabies control programs administered under the direction of state or federal government agencies. This vaccine was studied under both laboratory and field trials prior to distribution and use in 1995 to control the spread of various strains of the rabies virus. No ecological concerns were determined to be associated with the licensing of the rabies vaccine (USDA 1991, 1992, 1993, 1994a, 1994b, 1994c, 1995a, *undated a*, *undated b*). USDA determined that the parental vaccinia virus has not established itself in nature, is readily consumed by target animal species, and does not cause bioaccumulation in the environment. Mitigative measures required under the decision included public education and notification efforts prior to distributing the baits, and the placement of warning labels on each vaccine-laden bait.

EA and Finding of No Significant Impact – Proposed Field Application of an Experimental Rabies Vaccine, Live Vaccinia Vector, in South Texas. This EA and its FONSI completed in 1995 analyzed the environmental effects of experimental distribution of ORVAC baits containing V-RG to eliminate and stop the spread of coyote rabies in south Texas (USDA 1995b). APHIS determined the action would have a negligible adverse impact on the quality of the human environment.

EAs and Findings of No Significant Impact on proposed field trials/tests of live experimental vaccinia-vector recombinant rabies vaccine for raccoons. APHIS analyzed the potential environmental impacts of six separate field trials or tests of the recombinant V-RG vaccine in several northeastern states. In EAs and FONSIs covering those actions, (USDA 1991, 1992, 1993, 1994a, 1994b, 1994c), APHIS determined that these actions would have a negligible adverse impact on the quality of the human environment.

Risk Analyses for ORVAC using the V-RG recombinant virus. Two formal risk analyses on the rabies vaccine -- live vaccinia vector (i.e., the recombinant V-RG vaccine) have been prepared previously by APHIS (USDA *undated a and undated b*). Both analyses concluded the risk of adverse effects to animal safety, human safety, or the environment to be negligible.

1.7 DECISION TO BE MADE

Based on the scope of this EA, the decisions to be made are:

- Should the NPS approve ORVAC bait distribution at several NPS units within the Northeast Region's Mid-Atlantic Network Parks grouping (see Section 1.2 for a list of park units)?

- Would the proposed action have significant impacts on the quality of the human environment requiring preparation of an EIS?

1.8 GOALS

The primary goals of the proposed raccoon ORVAC program are:

- to cooperate with involved state agencies and APHIS-WS in eliminating or stopping the northward and westward advance of the raccoon strain of rabies in the eastern U.S. by approving the use of ORVAC on NPS lands to immunize portions of target species populations along the leading edges of the rabies fronts; and

- to cooperate with involved state agencies and APHIS-WS in reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans in the areas where the ORVAC programs are conducted.

Monitoring
APHIS-WS and involved state agencies will be responsible for determining the overall success of the ORVAC program and will use data collected from areas outside of NPS lands to monitor vaccination rates and instances of raccoon rabies virus.

1.9 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

Actions Analyzed/Site Specificity. This EA analyzes the potential environmental effects of NPS participation in an ORVAC program at numerous parks in thirteen states located within the NPS Northeast Region's Mid-Atlantic Network Parks grouping (see Section 1.2 for a list of NPS units). The program would support the involved state agencies' efforts of eliminating or stopping the northward and westward spread of raccoon rabies in the U.S.

Period for which this EA is Valid. This EA will remain valid until the NPS determines that new needs for action, new unforeseen significant issues, or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be revised pursuant to NEPA.

1.10 SCOPING PROCESS

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an EA. The NPS Northeast Region conducted internal scoping with appropriate staff from the NPS and APHIS-WS. The interdisciplinary internal scoping process defined the purpose and need, identified potential actions to address the need, determined what the likely issues and impact topics would be, and identified the relationship, if any, of the proposed action to other planning efforts at NPS units located within the potentially affected states.

The external scoping process was conducted with the public and interested and affected groups and agencies. A scoping notice was issued on January 29, 2004 and was directly mailed to 254 interested and affected groups and agencies, including potentially affected American Indian tribes. Comments were solicited during external scoping until March 5, 2004. Six comment letters were received during the 36 day scoping period. Comments were received from: 1) Robert Ellis, Assistant Director, Wildlife Division, VA Department of Game and Inland Fisheries; 2) Michael Yarnall, DVM, President - Blue Mountain Eagle Climbing Club and Wilderness Parks Association; 3) Donald Lein, DVM, PhD, Cornell University, College of Veterinary Medicine; 4) Tom Worthy, Game Warden, Fredricksburg Police Department; 5) Peter Irvine, USDA-Forest Service; and 6) Douglas Morris, Superintendent,

Shenandoah National Park. All commenters were in support of the program, but some had additional issues or comments they wished to have discussed in this EA:

- The Appalachian National Scenic Trail is located on NPS-administered land as well as other federal, state, and local lands. For instance, the Appalachian National Scenic Trail in GA, NC, TN, VT, and NH is located primarily on USDA-Forest Service managed lands. Other portions of the trail comprise federal, state, and local lands. These lands are not contiguous as they were acquired to protect the trail in between other public land areas. The NPS cannot authorize any program on lands administered by other agencies.

- Coordinate ORVAC programs with state and local governments and private organizations to include as much land at the leading edge of the spread of rabies.

- It appears the placement of baits in the mentioned NPS areas does not provide a complete barrier. What is the ultimate goal to connect all landscapes in between these locations?

- It would be extremely helpful if information regarding the rabies control that is occurring on adjacent lands was provided. Please provide names and contact information of those you are working with in Virginia, it would greatly facilitate interactions on NPS lands.

- The goals stated in the scoping notice are not definitive enough. It is unclear how achievement of goals will be determined.

- More detailed information regarding the proposed action should be made available. For instance, what will the shape of treatment blocks within the park be or the location of treatment transects? Will a map be provided to the NPS office? What will the total treatment area acreage be within the park? The proposed action does not address how many years of treatment are estimated. What measures will be taken to protect sensitive areas and resources? It would be helpful to provide bait densities in English units as well as metric units. Will ground placement of bait be an option?

- Resource issues and concerns: What will be the fate of the plastic residue that will be eliminated by the ingesting animals? Have cornstarch-based pouches been considered? More information needs to be provided regarding the adverse effects on nontarget species. Given the fact that national parks often have a diverse and abundant array of carnivores and omnivores, how can we be sure the bait density will be sufficient to reach the raccoons in each park? What accommodations will be made to work around high visitor use areas and seasons? Will public use closures be necessary? We recommend bait treatments take place in March as opposed to the fall because food is scarcer, young animals have not yet emerged from dens, and there are fewer visitors in the park. What measures will be taken to avoid sensitive habitats; particularly peregrine falcon hack sites and potential nesting areas? The Scoping Notice states that no animals will be collected from the park, but no indication is given about alternative methods for monitoring vaccination success or failure.

No other alternatives were proposed.

Appendix B

2.0 CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.1 ISSUES

From comments received during scoping periods for other ORVAC EAs and interactions and input received from those involved with the national ORVAC program, the following issues were determined to be germane to the proposed action and were considered in detail in Chapter 4:

- Potential for adverse effects on people that become exposed to the vaccine or the baits.
- Effects of the ORVAC V-RG vaccine on raccoons.
- Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.
- Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.
- Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.
- Potential for the V-RG virus to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animal
- Potential for aerially dropped baits to strike and injure people or domestic animals.
- Potential effects on NPS wilderness areas
- Potential impacts on visitor use/experience

2.2 ISSUES DISMISSED FROM FURTHER ANALYSIS

2.2.1 Potential for Adverse Impacts on Wildlife from Aircraft Overflights

The concern here is that wildlife species on NPS lands might be disturbed by the aircraft used in ORVAC bait distribution to the point that they are adversely affected.

- USDI (1995) reviewed studies on the effects of aircraft overflights on wildlife. The report revealed that a number of studies have documented responses by certain wildlife species that suggest adverse impacts could occur. Few if any studies have proven that aircraft overflights adversely impact populations, although the report stated it is possible to draw the conclusion that impacts to wildlife populations are occurring. It appears that some species will frequently or at least occasionally show adverse responses to even minor/short-term overflight occurrences. In general, it appears that the more serious potential impacts occur when overflights are *chronic*, i.e., they occur daily or more often over long periods of time. Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. ORVAC program aerial bait distribution activities are not chronic, but occur only once per year. They are typically conducted at about 500 feet above ground level and only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. Bait drops are normally conducted one time during the spring or fall months (February 1-May 31 and August 15-November 30).

The following are some examples of species or species groups that have been studied with regard to this issue along with a determination of potential impacts from ORVAC aerial overflights:

- Colonial Waterbirds. Kushlan (1979) reported that low level (390 feet followed by a second flight at 200 feet) overflights of 2-3 minutes in duration by a fixed-wing airplane and a helicopter produced no "drastic" disturbance of tree-nesting colonial waterbirds, and, in 90 percent of the observations, the individual birds either showed no reaction or merely looked up. ORVAC program overflights typically occur at about 500 feet above ground and would only fly momentarily over any one point on the ground. Thus, it appears that ORVAC program overflights would result in little or no disturbance to colonial waterbirds.

- Greater Snow Geese. Belanger and Bedard (1989, 1990) observed responses of greater snow geese (*Chen caerulescens atlantica*) to man-induced disturbance on a sanctuary area and estimated the energetic cost of such disturbance. They observed that disturbance rates exceeding two per hour reduced goose use of the sanctuary by 50 percent the following day. They also observed that about 40 percent of the disturbances caused

interruptions in feeding that would require an estimated 32 percent increase in nighttime feeding to compensate for the energy lost. They concluded that overflights of sanctuary areas should be strictly regulated to avoid adverse impacts. ORVAC program overflights typically occur at about 500 feet above ground and would only fly momentarily over any one point on the ground. Thus, it appears that ORVAC program overflights would result in little or no disturbance to snow geese or other waterfowl species.

- Raptors. Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period. Their results also showed similar nesting success between hawks subjected to such overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but showed that ferruginous hawks (*Buteo regalis*) are sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, and neither were they alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that 5 species of hawks, 2 falcon species, and golden eagles were "incredibly tolerant" of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and never limiting to productivity. These studies indicate that overflights by ORVAC program aircraft should have no significant adverse impacts on raptor populations by affecting nesting success.

- Bald Eagles. Several studies have shown that bald eagles (*Haliaeetus leucocephalus*) elicited varied responses (e.g., no response, alert, agitation, or flushing) by overflights of different types of aircraft such as military jets, fixed-wing aircraft, light planes, and helicopters (Grubb and Bowerman 1997, Watson 1993, Stalmaster and Kaiser 1997). Helicopters appeared to produce the greatest response, with military jets second, and fixed wing and light planes third (Grubb and Bowerman 1997, Watson 1993, Stalmaster and Kaiser 1997). The frequency of response and frequency of flight by bald eagles both increased through the nesting season from February to June (Grubb and Bowerman 1997). However, bald eagles were disturbed at higher rates when there were no young in the nest, when they were away from the nest, or when helicopters were hovering rather than moving (Watson 1993). The distance between eagle and aircraft, overflight duration, number of passes over nest, and type of aircraft appeared to be the most important characteristics influencing eagle responses (Grubb and Bowerman 1997, Watson 1993, Stalmaster and Kaiser 1997). However, Grubb and King (1991) concluded breeding bald eagles in Arizona may have become habituated to aircraft. Habituation was also reported at a nest site near a military air base in Michigan (Grubb et al. 1992, Grubb and Bowerman 1997). Nesting bald eagles have also been surveyed from fixed-wing aircraft with minimal disturbance (Fraser et al. 1985, Watson 1993). In general, conclusions about adverse effects on bald eagles and other raptors from aircraft overflights appear to be speculative. However, no direct evidence of adult or young mortality during helicopter or fixed-wing overflights has been observed (Watson 1993, Fraser et al. 1985). Although habituation may occur, most findings supported the use of buffer zones to distance nesting bald eagles from aircraft activity. Watson (1993) recommended helicopters remain at a distance greater than 60 meters from nests. Stalmaster and Kaiser suggested a buffer of 400-800 meters from military activity such as boats, aircraft and explosions. However, this suggestion is for wintering bald eagles. Grubb and Bowerman (1997) recommended any type of human activity be conducted at a distance of 400 meters or greater from nesting bald eagles. If this limitation is impractical, they recommended that duration and number of aircraft and/or passes be limited to less than 5 minutes and one aircraft and/or pass. This scenario would be expected for rabies bait distribution overflights, which would only involve one overflight pass, once per year, in which the duration of the pass over a given nest site would only be a few seconds at most.

Occasional overflights (i.e., radio telemetry, GIS mapping, commercial flights, and military training routes by fighter jets, helicopters, and/or transport ships) may occur over park units. Overflights for the purposes of ORVAC bait distribution activities would only occur once per year and aircraft will only fly momentarily over any one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. The potential impact would be of short-term duration, on a local scale, with negligible intensity and should not add appreciably to the frequency of overflights. The addition of one more overflight per year for ORVAC bait distribution should not constitute a substantive increase in any effects that might occur as a result of

overflights. Furthermore, the types of aircraft used in bait distribution, the DeHavilland (DHC-6) Twin Otter and Beechcraft King Air B200, meet all Federal Aviation Regulation (FAR) requirements regarding noise limits (FAR Part 36). Therefore, cumulative impacts from the combination of ORVAC bait distribution overflights and other overflights should be negligible. Thus, the short-term duration, infrequency, and negligible intensity of flights over any given area, in addition to the tolerance of wildlife of such activity, would have a negligible adverse environmental impact on wildlife as a result of ORVAC program overflights.

At the request of the NPS, APHIS-WS consulted with the USFWS on migratory bird issues with regard to the ORVAC program on NPS units. The USFWS – Division of Migratory Birds in Hadley, MA (NE Regional Office) determined there would be no adverse impacts to migratory birds from the ORVAC program. However, the USFWS NJ Field Office supervisor stated in informal consultation that aerial overflights may adversely affect the federally listed (threatened) bald eagle on or adjacent to the Appalachian National Scenic Trail in NJ if activities are conducted during the nesting season. The USFWS stated that even single passes of low-flying aircraft can cause abandonment of eagle nests or injury to flightless young. To ensure that nesting bald eagles are not adversely affected by low-flying aircraft, the USFWS recommends that flights maintain a minimum vertical distance of 1,500 feet above ground level in the vicinity of the nest sites or at least 1 mile lateral distance from the nest sites. If aerial distribution of baits occurs during the nesting season, the USFWS requests bait disbursal activities be coordinated with the USFWS NJ Field Office 30 days prior to bait distribution to obtain a current list of eagle nest locations that may be affected by use of low-flying aircraft. The USFWS believes aerial distribution of baits outside the nesting season is unlikely to adversely affect nesting eagles. No evidence has been found to indicate harm to eagles or other raptors as the result of an annual overflight. In addition, the annual overflight is even less likely to adversely impact migratory birds if/when flights occur in the fall after the birds have dispersed. Therefore, impacts from ORVAC bait distribution overflights should be negligible.

2.2.2 Potential Human Health Impacts Resulting from the Human Consumption of a Vaccinated Wild Animal

The issue expressed here is the potential to develop a vaccinia infection from eating a vaccinated animal that has eaten one or more ORVAC baits. Dr. Carolin Schumacher of Merial, Inc. was consulted to obtain information on this issue. Mahnel (1987) reported results of experiments to determine the stability of poxviruses (which include vaccinia used in the V-RG vaccine). "Naked" vaccinia (i.e., vaccinia found outside of host cells) will be inactivated within minutes by heat above 133 degrees Fahrenheit, by ultra-violet irradiation (sunlight), or by exposure to acid with a pH of 3 or less[4] (e.g., similar to the acid environment found in the stomach of animals). In contrast, however, poxviruses can be relatively stable for years in dry dust or in dried lesion crusts.

The vaccinia from V-RG would generally only bind to animal tissues in the mucous membrane of the oral cavity, pharynx and oesophagus since V-RG does not have the tendency to spread throughout the animal. Those particular tissues are rarely consumed by humans, but if they were, they would most likely be cooked which would kill the virus. Also, concentrations of vaccinia in those tissues should be low because mucosa is not considered a tissue where the virus tends to accumulate (Schumacher, Merial, Inc., pers. comm. 2001 *in* USDA 2001a).

Although cell-bound vaccinia is generally more resistant than free virus, humidity and cellular enzyme activity in the tissues as well as bacterial decomposition (e.g., in the gut of ruminants), normally results in inactivation of the virus. In the environment, inactivation of pox viruses is accelerated by temperature changes (Schumacher, Merial, Inc., pers. comm. 2001 *in* USDA 2001a).

The above information suggests that possible sources of contamination with vaccinia would be V-RG dried onto the fur of an animal, ingested virus in the stomach, or cell-bound virus in mucous membranes. However, with the combined activity of sunlight and ultraviolet light, humidity, stomach pH and/or bacteria/enzymes, temperature fluctuations, and cooking heat, the risk to human health should be negligible, especially when taking into consideration the attenuated or weakened condition of the vaccinia in the V-RG vaccine. Therefore, the potential for adverse health effects from consuming animals that have eaten ORVAC baits should be low. Additionally, hunting

[4]pH is the measure of acidity or alkalinity of a solution with numbers below 7 representing a progressively more acidic solution. A pH of 3 is highly acidic.

is not permitted in any of the NPS units listed under the proposed action, thus people would not be expected to consume any animals that eat ORVAC baits distributed at these park units.

2.2.3 Potential for ORVAC Bait Distribution to Affect Organic Farming

This issue concerns the potential for ORVAC baits dropped on crops and livestock operations certified as "organic" under federal regulations to affect the status of the organic certification of such farms. Farmers and livestock producers were concerned they would not be able to sell, label, or represent their harvested crop or plant as organically produced if it had contact with the prohibited substance, which is the vaccine – V-RG (CFR7 Part 205.672). In particular, this concern was raised by a producer of organically raised venison in Ohio (R. Krogwold, Ohio Dept. of Health, pers. comm. 2001) and by an organic farmer in Florida (H. McConnell, APHIS-WS, pers. comm. 2003).

The ORVAC baits are comprised of a matrix of fishmeal and an ethylene copolymer which is a plastic material. The purpose of the polymer is to hold the fishmeal attractant together in a block that can withstand being dropped from an airplane and that will not dissolve or crumble apart readily when and if it is exposed to rain or melting snow. The process for producing the bait blocks eliminates all potentially reactive compounds (such as ethylene and vinyl acetate) that might have the potential for uptake by plants or absorption into the tissues of animals that consume the baits. Thus, the inorganic polymer in the ORVAC baits is totally nonreactive and cannot be absorbed by plants or animals (M. Smith, Bait-Tek, pers. comm. 2001). It is also among the types of materials approved by the Food and Drug Administration for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food (21 CFR Part 177). Therefore, the fishmeal polymer baits should pose no risk of contaminating crops or animals raised for food and, consequently, should have no effect on the ability of certified organic farms to maintain their status.

Field baiting studies suggest deer are not generally attracted to the ORVAC baits. Out of more than 4,300 baits exposed to target and nontarget animals in field bait acceptance studies in Georgia, Ohio, and Texas, none were observed to have been taken or consumed by deer, despite the prevalence of deer in the areas where the bait studies were conducted (Linhart et al. *unpublished* 2001). Sulfur compounds are a byproduct of the breakdown of animal proteins, including those found in fishmeal (D. Nolte, APHIS-WS, National Wildlife Research Center (NWRC), pers. comm. 2001) and are generally repellent to herbivores (Nolte et al. 1994). Therefore, the ORVAC baits used to address raccoon rabies problems are probably at least somewhat repellent to deer, which probably accounts in part for the lack of observed bait take by deer in the studies reported in Linhart et al. (*unpublished* 2001). For these reasons, it is unlikely that the ORVAC baits would be consumed by deer on venison farms that are certified as organic producers.

On April 15, 2003, the USDA-Agricultural Marketing Service (AMS) ruled that ORVAC bait blocks, consisting of a vaccine imbedded in fishmeal bound by a polymer binding agent, on an organic operation would not have an adverse impact on organic operations. This ruling was posted on the USDA-AMS website at www.ams.usda.gov/nop. The USDA-AMS considers the ORVAC program to be an emergency disease treatment for the control of rabies and, as such, is addressed under National Organic Program (NOP) section 205.672, Emergency Pest or Disease Treatment. The USDA-AMS determined that "…in the unlikely event that a bait block breaks and exposes a plant(s) to the vaccine, the organic producer can remove the affected plant(s) with no adverse effect on the operation's certification. This would comply with NOP section 205.672(a). The organic status of animals feeding on the ORVAC bait block and not penetrating the vaccine would not be adversely affected. In the unlikely event that an animal consumes the vaccine within the ORVAC bait block that animal will lose organic status as provided in NOP section 205.672(b)." The USDA-AMS believes there to be little chance that an organic animal will consume the vaccine within an ORVAC bait block; however, to reduce the chances of livestock consumption, producers can relocate any bait found within an area containing livestock to a point outside of that area.

2.2.4 Potential Impacts on Water Resources

A concern has been expressed regarding the potential impacts of unconsumed V-RG vaccine and baits adversely impacting ground and surface water resources through direct and indirect exposure. Those baits that are not

consumed may remain in the environment for several months after placement dependent upon environmental conditions (precipitation, temperature, etc.) and the physical condition of the baits. Potential impacts to water resources are greatly reduced by the limited number of baits that are dropped in a specific area, the biodegradability of the vaccine liquid and baits, the high consumption rate of ORVAC baits by animal species, the safety and efficacy of the vaccine, and the Standard Operating Procedures (SOPs) that are used when dropping baits near a large water source. This conclusion is based upon:

- The possibility of a large quantity of ORVAC baits being exposed to a site specific water resource is extremely low due to the bait distribution densities used by the program. Under the proposed program ORVAC baits would be distributed from aircraft at an average density of 75 per square km.

- The baits are non-toxic. The baits used for the raccoon ORVAC program are small blocks of fishmeal that are held together with a polymer binding agent and are considered to be "food grade" materials. Therefore the unconsumed bait material would biodegrade when exposed to the environment causing little to no effect on water resources.

- The vaccinia virus and other orthopoxviruses will not replicate in water and do not replicate or reproduce themselves in non-warmblooded species (C. Rupprecht, CDC, pers. comm. 2002). Therefore, ORVAC is not expected to cause any adverse effects on fish, reptiles, amphibians, or any invertebrate species should any members of these species groups consume ORVAC baits or otherwise be exposed to the vaccine.

- The ORVAC baits are readily taken up and consumed by wildlife species thereby limiting long term exposure to the environment. The likelihood of a bait being consumed is dependent upon several factors including animal population densities (target and nontarget species), bait preference, and the availability of alternative food sources. In field tests conducted in the U.S., the majority of ORVAC baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100 percent of the baits being consumed within a 7 day period (Farry et al. 1998a and 1998b, Hable et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989a, Linhart et al. 1994, Steelman et al. 2000, USDA 1995a).

- The V-RG virus biodegrades when exposed to the environment. The V-RG virus that is not consumed by the target species or other vertebrates will become inactivated over a relatively short period of time. Persistence and stability of the V-RG virus outside of an organism is highly dependent on ambient temperature and local environmental conditions; the higher the temperature the quicker the virus will become inactive (USDA 1992, 1995a). For example at temperatures between 68 and 100 degrees Fahrenheit the liquid vaccine potency remains stable for approximately 14 to 7 days, respectively, in the un-punctured sachet or inside the bait. In situations where the bait and sachet are damaged inactivation of the V-RG virus will occur more rapidly. A more detailed discussion of the development of ORVAC baits can be found in Chapter 1.

- Program SOPs limit the possibility of ORVAC baits being directly dropped into large water sources such as rivers, lakes, and reservoirs. When the aircraft approaches a large body of water the bait dropping equipment is shut off approximately ¼ mile from the water source to reduce the possibility of ORVAC baits falling into the water. Nevertheless, due to changing environmental conditions and the limited possibility of human error when operating the bait dropping equipment there is the possibility that baits may inadvertently be dropped into a body of water. Exposure of the V-RG vaccine into a water source from an intact bait and sachet is highly unlikely. The vaccine is enclosed in a sealed sachet thereby limiting the possibility of the vaccine liquid being directly released into a water source. Even if the vaccine was released into a water source through a damaged or punctured sachet, it is highly unlikely that the vaccine will cause any adverse affects since the vaccine liquid is biodegradable and nontoxic (USDA 1991, USDA *undated a and undated b*).

The above information indicates that V-RG vaccine and baits pose no threat to groundwater or surface water through direct or indirect means.

2.2.5 The Affected Area Described in the EA includes NPS Lands that Have Not Been Identified as Having a Rabid Raccoon Problem

The affected area of the EA includes NPS lands that have or have the potential for a raccoon rabies outbreak to occur. ORVAC baits are distributed based upon vaccination zones. These vaccination zones are determined in cooperation with the involved state rabies task forces, state agencies, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. Vaccination zones are delineated based on the most current distribution of rabies cases and the expected direction of disease spread. Therefore some, all, or none of the NPS lands identified in this EA may be involved in an ORVAC bait distribution program on an annual basis. Figure 1-4 in Chapter 1 shows the current anticipated ORVAC zone based upon recent outbreaks of the virus. The numerous NPS units included in this EA (see Section 1.2 for a list of park units) were chosen since they have the greatest possibility of being involved in the states' overall efforts of stopping the northward and westward spread of the rabies virus in the U.S.

2.2.6 Effects on Carnivore Populations in the Absence of Rabies

Concern has been expressed that specific carnivore populations, namely raccoons, may increase in the absence of the rabies virus as a mortality factor, leading to adverse effects on prey populations such as threatened and endangered species. The raccoon strain of the rabies virus has only relatively recently spread, and currently is contiguously distributed from Alabama to Maine, west to the eastern Ohio border with Pennsylvania (Krebs et al. 2001, Kemere et al. 2001). Translocation of rabid raccoons to the mid-Atlantic states has been implicated in establishing a new rabies foci in the mid-1970's (Krebs et al. 1999), from which rabies has spread through the raccoon population at rates averaging about 30 miles/year (Kemere et al. 2001).

As a disease existing within natural systems, raccoon rabies is only one of several diseases which can influence dynamics of its vector and reservoir populations, and there is no indication that it has more serious effects on population levels than several other conditions. Milius (1998) noted that vaccinating raccoons in the city of Scarborough, Ontario against canine distemper in the early 1990s successfully reduced the prevalence of the disease in raccoons. The vaccination program did not trigger the population boom that some suggested. Canine distemper provides a good model for studying whether a disease regulates a population (Milius 1998). The cyclic nature of enzootic rabies suggests that it causes significant changes in numbers of animals, but direct evidence is fragmentary. Scientists have observed for years that raccoon populations decrease during the initial epizootic activities, but stabilize at pre-infestation levels after a few years (McLean, pers. comm. 2004).

In Europe and Ontario, an increase in fox densities coincided with reduction of rabies by oral vaccination, but was found to result from ecological changes as much as or more than from rabies control; increases occurred at the same times in regions which had no rabies (MacInnes and LeBer 2000). An Ontario Ministry of Natural Resources project trapped, vaccinated, and released skunks and raccoons for both rabies and canine distemper in certain areas of the City of Scarborough, Ontario. Researchers concluded that the vaccine had decreased the prevalence of the diseases (1.4 percent of raccoons infected versus 8.3 percent prior to implementation of the program), yet the program did not change overall growth trends in the raccoon population (Milius 1998). Canine distemper may have impacts as large as or larger than rabies on raccoon populations, but where measured explicitly during one outbreak it had only small effects. Parvoviruses, infectious canine hepatitis, and other viral diseases have potential to severely affect fox, skunk, and raccoon populations. The whole question of the influence of disease on wildlife numbers is complex and far from fully explained (MacInnes and LeBer 2000). From what is currently known about the interaction of the rabies virus and raccoons, significant changes in population numbers due to the treatment of the rabies are not common (McLean, pers. comm. 2004).

Guerra et al. (2003) does not support the idea that rabies exists specifically to control raccoon populations. Guerra et al. (2003) state that after an initial peak, populations approach lower 'steady-state' conditions. Based on surveillance data, raccoon rabies did not exist outside a focus in Florida before the 1940s. Therefore, elimination of raccoon rabies should merely create the scenario before raccoon rabies spread in the eastern U.S. (Rupprecht and Smith, 1994). No evidence exists that the carrying capacity for raccoons could be increased by the implementation of ORVAC programs compared to population levels before the introduction of rabies (C. Rupprecht, CDC, pers. comm. 2003).

Prior to the introduction of raccoon rabies into the mid-Atlantic region in the late 1970's, canine distemper was considered a primary disease mortality factor in raccoons, gray foxes, and skunks (Roscoe 1993, Davidson et al.

1992). The epizootiology of canine distemper in raccoons in New Jersey and Florida has been characterized by outbreaks at the end of the mating season in March and with increased movements of young in September (Roscoe 1993, Hoff et al. 1974). Because of the cyclic nature of canine distemper outbreaks (4 year intervals), the wide distribution of canine distemper cases, and the low incidence of the disease between epizootic peaks in New Jersey, Roscoe (1993) proposed an enzootic status for canine distemper for raccoons that becomes epizootic when raccoon densities reach high levels. Evans (1982) found that 50 to 90 percent of raccoons and gray foxes may be incapable of producing protective levels of antibody against the canine distemper virus, implicating it as a potentially important disease mortality factor. Davidson et al. (1992) diagnosed canine distemper in 78 percent of gray foxes studied in the southeastern U.S. and found canine distemper to be more significant as a mortality factor for gray foxes than all other infectious and noninfectious diseases combined. Roscoe (1993) reported that the effects of canine distemper on raccoon populations may diminish if raccoon rabies spreads and that concurrent canine distemper and rabies epizootics may become more common. The dynamics of sympatric rabies and canine distemper are not well understood; however, rabies may compensate for deaths that would have historically occurred due to canine distemper infection. Important attributes of canine distemper include that it is not a zoonotic disease like rabies and it historically has been implicated as a virus of importance to carnivore mortality.

As an omnivore, the raccoon may play an important role in community and ecosystem interactions. In coastal ecosystems, such as Canaveral National Seashore in Florida, raccoons may function as significant seed dispersers and consumers of crustaceans, small fish, sea turtle hatchlings, small mammals, and berries (Ratnaswamy and Warren 1998). This prevalence of invertebrate prey and plant matter in coastal raccoon diets is consistent with general observations made on raccoons throughout their range. Thus, raccoons have ecological connections with many components of the coastal biological community in addition to sea turtle eggs and hatchlings (Ratnaswamy and Warren 1998). At Canaveral National Seashore, lethal removal of approximately 50 percent of the raccoon population using the nesting beach did not result in a significant reduction of nest depredation (Ratnaswamy and Warren 1998).

In Ontario, it appears that human activities and disease have had no significant impact on the survival of raccoons. Despite being subjected to trapping, hunting, collisions with vehicles, infectious diseases, and removal by animal control agencies, raccoon populations are thriving. Also, habitat deterioration, habitat destruction, and urbanization seem to have had little impact on limiting raccoon populations (Rosatte 2000). The most effective control measure is likely to be the reduction or elimination of human-created food sources (e.g., covering refuse containers, removing refuse before dusk), which support raccoons at these high densities (Prange et al 2003). With raccoon population numbers annually regulated by many different environmental factors, including habitat, food, weather, disease, predation, and humans, long-ranged assessments of the affects of raccoons on localized ecological systems is difficult. For sites where raccoon populations represent a threat to park resources, efforts must be taken annually to address those threats.

The Parks of the Northeast Region of the NPS understand the potential health significance of raccoon rabies on humans and other native animals as it continues to expand into new areas of the northeastern U.S. However, intervention into the biological activities of a natural system for any reason is something that NPS managers do with great care. NPS Management Policies require “that the environmental costs and benefits of proposed operations, development, and resource management are fully and openly evaluated before taking actions that may impact the natural resources of parks. The evaluation must include appropriate participation by the public; the application of scholarly, scientific, and technical information in the planning, evaluation, and decision-making processes; the use of NPS knowledge and expertise through interdisciplinary teams, and processes; and the aggressive incorporation of mitigation measures, pollution prevention techniques, and other principles of sustainable park management.” As the NPS implements the ORVAC program within its parks, every effort will be made to evaluate the park-specific benefits and impacts of the project. To accomplish this goal, the NPS will work with APHIS-WS and other cooperating agencies to assure that surveillance is carried out to track raccoon populations, predation activities by raccoons, and to track rabies prevalence in raccoon populations. Great care will be made to protect native resources found in the parks, with a watchful eye on resources that are rare, threatened, and endangered. Resources within the NPS, for the collection of this information, are extremely limited and would therefore be provided by APHIS-WS or other cooperators within the national rabies management team.

In situations where diseases like West Nile Virus, Lyme Disease, Hantavirus, and Raccoon Rabies could affect park resources, visitors, and employees, the NPS is directed to seek the guidance of the U.S. Public Health Service and CDC. The director of the CDC has indicated that raccoon rabies presents a serious public health problem in the U.S. (letter to APHIS-WS, dated May 29, 2001). Potential direct exposure to rabid raccoons, or indirect exposure by a pet that had an encounter with a rabid raccoon, creates this human health threat. The NPS Public Health Program concurs with the CDC assessment that rabies is a significant public health risk and that every reasonable effort should be made to control the disease (M. Wild, NPS, pers. comm. 2004).

2.2.7 Effects of Nontarget Species Consumption of ORVAC Baits on Program Effectiveness

Consumption of ORVAC baits by nontarget species is not expected to impact program effectiveness. As described in section 1.1.3, baits are developed to attract target species. The use of target preferred baits increases the likelihood of the target species consuming the baits prior to the discovery of baits by nontarget species. Furthermore, bait distribution densities are developed to compensate for the uptake of baits by nontarget species. Baits are distributed at densities that allow raccoons the opportunity to come in contact with intact baits. It has been determined based upon the success of ORVAC bait drops for raccoons by the various state ORVAC programs in other parts of the thirteen involved states, with similar wildlife species composition as those found in the parks, that the distribution of 75 baits per square km would be sufficient to maintain program effectiveness.

2.2.8 Potential Impacts to Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by USDI agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources in these units. The lands comprising the units are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, the Indian Trust Resources issue was dismissed as an impact topic.

Copies of this EA will be forwarded to each tribe traditionally associated with each park unit's lands for review and comment. If the tribes subsequently identify the presence of ethnographic resources, appropriate mitigation measures would be undertaken if necessary in consultation with the tribes. The location of ethnographic sites would not be made public. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during the proposed program, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC 3001) of 1990 would be followed. Because there are no known ethnographic resources within the project area, ethnographic resources issues were dismissed as an impact topic. Also, since the ORVAC bait distribution does not involve any ground disturbance, there is little or no potential for disturbance of ethnographic resources.

2.2.9 Potential for Adverse Impacts on Lightscape

The NPS strives to preserve the natural ambient landscapes, which are natural resources and values that exist in the absence of human-caused light. Recognizing the roles that light and dark periods play in natural resource processes and the evolution of species, the NPS seeks to protect natural darkness and other components of the natural lightscape in parks. (NPS policy for this topic is found in *Management Policies 2001* (USDI 2000b), 4.10, Lightscape Management.)

The concern may be that the lightscape conditions in a national park environment might be adversely affected by aircraft overflights during ORVAC bait distribution. Aircraft overflights for ORVAC bait distribution normally occur during daylight hours; however, certain circumstances (e.g., to avoid dropping baits during peak visitor use periods, security issues, etc.) may necessitate baiting outside of daylight hours. Aerial ORVAC bait distribution activities would only occur once per year and aircraft would only fly momentarily over any one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait

distribution. The potential impact would be of only momentary duration, on a local scale, with negligible intensity. Therefore, this issue was dismissed as an impact as it will have no chronic effect on lightscape (see Section 2.2.1 for more information).

2.2.10 Potential for Adverse Impacts on Soundscape

An important part of the National Park Service mission is preservation of natural soundscapes associated with national park units. The natural ambient soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. (NPS policy for this topic is found in DO-47, *Sound Preservation and Noise Management* and *Management Policies 2001* (USDI 2000b), 4.9, Soundscape Management.)

The issue expressed here is that the natural soundscape of national park units may be adversely affected by aircraft overflights during ORVAC bait distribution activities. Aerial ORVAC bait distribution activities would only occur once per year and aircraft would only fly momentarily over any one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. Overflights are also conducted at a minimum of 500 feet above ground level. Additionally, the types of aircraft used in bait distribution, the DeHavilland (DHC-6) Twin Otter and Beechcraft King Air B200, meet all FAR requirements regarding noise limits (FAR Part 36). The potential impact would be of extremely short-term duration, on a local scale, with negligible intensity. Therefore, this issue was dismissed as an impact as the ORVAC bait distribution activities will have no chronic effect on soundscape (see Section 2.2.1 for more information).

2.2.11 Potential for Adverse Impacts to Historical Properties

The NHPA and its Implementing Regulations (36 CFR 800) require federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings.

ORVAC activities described under the proposed action (Section 1.2) do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

The following state historical preservation officers have reviewed the proposed ORVAC program and have indicated that the proposed program will have no adverse effects on historic properties (copies of letters and responses are located in the Administrative Record for this EA):

- GA Department of Natural Resources, Historic Preservation Division
- ME Historic Preservation Commission
- MD Historical Trust
- MA Historical Commission
- NH Division of Historical Resources
- NJ Department of Environmental Protection– Historic Preservation Office
- NY State Office of Parks, Recreation and Historic Preservation
- NC Department of Cultural Resources, State Historic Preservation Office
- PA Historical and Museum Commission
- TN Department of Environment and Conservation, State Parks and Conservation

- VT Division for Historic Preservation
- VA Department of Conservation and Recreation
- WV Division of Culture and History

2.2.12 Potential for Adverse Impacts to Minority and Low-Income Populations

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires Federal agencies to analyze disproportionately high and adverse environmental effects of proposed actions on minority and low-income populations. NPS has analyzed the effects of the proposed action and determined that implementation would not have adverse human health or environmental impacts on low-income or minority populations.

2.2.13 Potential for Adverse Impacts to the Safety and Health of Children

Executive Order 13045 was passed to help protect children who may suffer disproportionately from environmental health and safety risks for many reasons. ORVAC activities as proposed in this EA would only involve legally available and approved methods that have been subjected to safety evaluations and testing. The vaccinia virus used as a carrier of the rabies glycoprotein is the same type of virus that was used in smallpox eradication, although more attenuated or weakened (USDA 1991, p. 39). The analysis in this EA supports a conclusion of negligible to no risk of adverse effects to children from the ORVAC baiting strategy. Implementation of the proposed action would not increase environmental health or safety risks to children, but would in fact reduce such risks by minimizing the potential for children to contract rabies. Children are particularly at risk from rabies because they are more prone to experiencing "undetected" or "unappreciated" exposures (Huntley et al. *unpublished* 1996) that do not lead to post-exposure vaccine treatments. Therefore, federal involvement in ORVAC programs is consistent with and helps to achieve the goals of EO 13045.

Resource Values. The following resource values would not be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range.

Irreversible and Irretrievable Commitment of Resources. Other than minor uses of fuels for aircraft and motor vehicles and other materials, there are no irreversible or irretrievable commitments of resources.

3.0 CHAPTER 3: ALTERNATIVES

3.1 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

3.1.1 Alternative 1. Authorize an ORVAC Program - Proposed Action (*this is the preferred alternative*)

Under this alternative, NPS would authorize the inclusion of several NPS units within the Mid-Atlantic Network Parks grouping located in several eastern states within the ongoing ORVAC program in the eastern U.S. to create zones of vaccinated target species that would then serve as barriers to eliminate and/or cease the further advancement of raccoon rabies virus variants. Vaccination zones would be determined in cooperation with state rabies task forces, state health departments, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve use of APHIS-WS federal funds to purchase and distribute ORVAC baits. On an annual basis, one treatment of ORVAC baits would be distributed by aircraft (fixed-wing airplane or helicopter) and ground placement on various park units within the ORVAC project area. The need to distribute baits on each of the parks would be accessed annually and based on the most current distribution of rabies cases and the expected direction of disease spread. The treatment would continue on a reoccurring basis until the goals of the ORVAC program have been met. A more detailed description of the proposed action can be found in Section 1.2 of this EA.

3.1.2 Alternative 2. No Action

This alternative would preclude the NPS from any involvement with an ORVAC program at various NPS units within the Mid-Atlantic Network Parks grouping located in several eastern states (see Section 1.2 for a list of park units). However, APHIS-WS, involved state agencies, and rabies task forces would continue the ORVAC program on lands not managed by the NPS. The "No Action" alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a basis for comparison with the other alternatives.

3.2 ALTERNATIVES DISMISSED FROM FURTHER ANALYSIS

3.2.1 An ORVAC Program with Animal Specimen Collections for Monitoring Purposes

Under this alternative, an ORVAC program would be implemented similar to the proposed action but would also include the collection of wild animal specimens from NPS lands for monitoring and project evaluation purposes through the use of a variety of live capture or lethal methods including shooting, leghold traps, cage traps, foot snares and wire cable neck snares (USDA 2001a). The state ORVAC programs within the thirteen involved states collect wild animals for monitoring purposes in other areas of each of the states (USDA 2004d). However, these state ORVAC programs have determined that it would not be necessary to collect wild animals for monitoring purposes on NPS units located within the affected states at this time or within the foreseeable future. For this reason this alternative was not considered further.

3.2.2 Live-Capture-Vaccinate-Release Programs

This alternative would involve the live capture of raccoons followed by administration of rabies vaccines by injection and release back into the wild. This strategy has been used in certain localized areas for reducing the incidence and spread of rabies in raccoons (Brown and Rupprecht 1990, Rosatte et al. 1990, Rosatte et al. 1992, Rosatte et al. 1993) and skunks (Rosatte et al. 1990, Rosatte et al. 1992, Rosatte et al. 1993). Currently, no vaccine is specifically licensed for this type of use (CDC 2000). However, certain injectable vaccines may be used "off-label" under the direction of veterinarians to vaccinate wild animal species in certain situations (Mitzel, APHIS-Veterinary Services, pers. comm. 2001 *in* USDA 2001a). This method generally results in a higher percentage of a raccoon population being vaccinated than ORVAC, but takes much longer to accomplish in a given area. For example, in Ontario, 7 trappers working from July to October were required to trap and vaccinate 50-85 percent of the raccoons in an area less than 700 $km.^2$, whereas the same area could have been treated with aerially dropped ORVAC baits in half a day (C. MacInnes, Ontario Ministry of Natural Resources, pers. comm. 2001). For these

reasons this alternative was not considered further.

3.2.3 Depopulation of Raccoons

This alternative would result in the lethal removal of raccoons throughout the zones where outbreaks of this variant of rabies virus is occurring or is expected to occur. The goal would be to achieve elimination of the raccoon rabies strain by severely suppressing populations of raccoons over broad areas so this specific variant of rabies could not be transmitted to other susceptible members of the same species. This could theoretically stop the forward advance of the disease and potentially result in elimination of the raccoon rabies variants since infected animals would die from rabies before they could transmit it to other members of the same species.

Population reduction is often suggested as a method to control rabies in wildlife populations since the disease is density dependent (Debbie 1991). Bounty incentives, regulated hunting and trapping, ingestible poisons, and fumigation of dens have all been employed to control populations with varying levels of success. MacInnes (1998) reviewed some of the past efforts to control rabies with population reduction of carrier species and concluded that, with a couple of exceptions, most such efforts have failed. In some of the situations, it could not be determined whether an observed decline or disappearance of rabies cases was attributable to population control work or to the disease simply reaching some unexplainable geographical limitation or just dying out on its own (MacInnes 1998). Also, population control as a strategy can be questionable because the leading edges of rabies outbreaks do not necessarily coincide with the edge of the range of the principal "vectors" (e.g., raccoons, gray foxes, and coyotes), nor are they always necessarily related to the population density of such vectors (MacInnes 1998).

The greatest difficulty with population reduction as a strategy for reducing or eliminating rabies is that a high level of effort must be maintained almost indefinitely (MacInnes 1998). Population suppression can be a challenge to maintain in many situations due to immigration (of other members of the same species from surrounding populations) and compensatory reproduction (i.e., larger litters and greater percentages of females breeding following population reduction) (Clark and Fritzell 1992, Connolly and Longhurst 1975). These two factors could result in local populations recovering to their previous population level in a relatively short period of time, thus requiring a sustained and frequent suppression effort to maintain populations at the desired levels.

For these reasons, and because depopulation of the raccoon species would be considered inconsistent with the NPS mission, this alternative was not considered further.

3.2.4 Employ Other Types of ORVAC instead of the V-RG Vaccine

Under this alternative, the NPS would use or authorize the use of a "modified-live-virus" (i.e., "attenuated" or weakened strains that have been shown to have little chance of causing rabies in treated animals) or perhaps "killed-virus" (i.e., "inactivated" virus) oral vaccines instead of the V-RG vaccine. Modified-live-virus vaccines include those that have been used in the past to vaccinate domestic animals by injection in the U.S. Oral baits that employed several strains of these types of virus vaccines have been investigated and used in Europe to stop the spread of rabies in red foxes (Flamand et al. 1993, Artois et al. 1993, Artois et al. 1997). They have also been tested in red foxes in Canada (Lawson et al. 1989, Lawson et al. 1997), and in red foxes and raccoons in the U.S. (Rupprecht et al. 1989, Rupprecht et al. 1992c).

The primary concern with attenuated or "live" virus vaccines (e.g., SAD and ERA) is that they can sometimes cause rabies (Flamand et al. 1993, Pastoret et al. 1992). Flamand et al. (1993) reported that one strain used widely in oral baits in Europe to vaccinate wild red foxes in the 1970s could cause rabies in rodents when injected and that the ability to cause rabies in nontarget animals by other modes (i.e., oral administration) could not be ruled out. Previously used attenuated strains are also "heat sensitive" which can limit their use in warmer seasons or climates (Pastoret et al. 1992). These types of safety concerns with attenuated rabies virus vaccines have been sufficient to prevent their approval for use in the U.S. (Rupprecht et al. 1992c).

Inactivated or "killed" virus rabies vaccines are safer than "live" vaccines in that they cannot cause rabies. This type of vaccine was found to be less effective in causing immunity when delivered into the intestinal tract in foxes (only 30 percent effective in test animals) and took 2 doses to cause immunity in the foxes that were successfully immunized (Lawson et al. 1989). Also, the amounts of virus particles that would have to be ingested in oral baits by

wild carnivores to effectively vaccinate them would be 100 to 1000 times the amount of the live-attenuated virus particles required (Rupprecht et al. 1992c). To manufacture vaccines with these amounts would probably be cost-prohibitive (Rupprecht et al. 1992c).

Currently, RABORAL V-RG is the only vaccine licensed for use in raccoons in the U.S. (CDC 2000). For all of the above reasons, this alternative was not considered further.

3.3 MITIGATION IN STANDARD OPERATING PROCEDURES FOR RABIES ORVAC PROGRAMS

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action.

A number of key mitigating measures are currently part of the standard operating procedures of state-operated ORVAC programs and would be used as part of the ORVAC program on NPS lands. These include:

- Public information and education actions and media announcements to inform the public about ORVAC bait distribution activities before they occur.

- Toll-free telephone numbers advertised in the media and on web sites for people to call for answers to questions.

- In the unlikely event of an adverse vaccinia virus exposure in humans, the CDC can make vaccinia immune globulin available to a state on a case-by-case basis to provide a level of additional assurance that such a reaction would be successfully treated.

- Training of bait distribution navigators to avoid dropping baits on people, structures, and large bodies of water (lakes, reservoirs, rivers). During aerial bait drop operations, the bait dispensing equipment is temporarily turned off over large bodies of water, human dwellings, and when people are observed below. Every effort would be made to drop baits during off-peak visitor use at NPS units.

- ORVAC baits would not be distributed by aircraft within 1/4 mile of water bodies to reduce the potential of baits entering the water source.

- Adherence of aircraft to air safety standards.

- Training of personnel in hand distribution of baits to avoid properties with greater risk of human or pet encounters with baits.

- Labels are affixed to each ORVAC bait instructing persons not to disturb or handle them and contain a toll-free telephone number to call for further information and guidance in the event of accidental exposure to the vaccine.

- Education campaigns by state and local health departments, the CDC, APHIS-WS, Cornell and Tufts Universities, and others are already occurring in conjunction with the ORVAC program to teach the general public about rabies prevention and risks (see sample press release in Appendix F or go to the CDC's website at http://www.cdc.gov/ or APHIS-WS' website at http://www.aphis.usda.gov/ws/rabies/index.html to learn more about rabies and its prevention).

- The Communication Planning Team, part of the Rabies Management Team, is developing a means to enhance interaction with the public on ORVAC, including web site creation. However, an immediate charge for this team is to bring together all key interests including raccoon hunters, dog trainers, rehabilitators, nuisance wildlife control operators, and agency personnel to seriously address translocation of rabies reservoir species, which could jeopardize national efforts to control terrestrial variants of rabies (Slate et al. 2002; R. Chipman, APHIS-WS, pers. comm. 2004). Translocation of raccoons from the southeastern U.S. to western Virginia and

West Virginia in the late 1970s was the probable origin of the epizootic mid-Atlantic region that had not formerly experienced raccoon rabies (Nettles et al. 1979, Slate et al. 2002).

3.4 ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is determined by applying the criteria suggested in Section 101 of the National Environmental Policy Act which states that "…it is the continuing responsibility of the federal government to…(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice; (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources."

Alternative 1, the Proposed Action, is the environmentally preferred alternative. Alternative 1 is believed to be the least environmentally intrusive alternative available for achieving the goals of eliminating and stopping the forward (northward and westward) advance of the raccoon strain of rabies in the eastern U.S. and reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans. Alternative 1 surpasses the other alternative (no action) by recognizing the range of national environmental policy goals as stated in Section 101 of the National Environmental Policy Act. Alternative 1 integrates "…safe, healthful….surroundings" with resource protection.

Appendix B

Table 3-1. Comparative Summary of Environmental Impacts

Issue	Expected Impacts by Alternative	
	Alternative 1. Authorize an ORVAC Program - Proposed action (*this is the preferred alternative*).	**Alternative 2. No action.**
Potential for adverse effects on people that become exposed to the vaccine or the baits.	Negligible adverse impacts from humans being exposed to baits and vaccine. Reduced threat of human exposure to the rabies virus.	No impact from being exposed to baits or vaccine. Potential moderate, adverse impacts from risk of human exposure to rabies.
Effects of the ORVAC V-RG vaccine on raccoons.	No adverse impacts. Beneficial impact from immunizing raccoons against rabies.	No impact from being exposed to bait or vaccine. Potential moderate, adverse impacts from continued exposure to and possibility of acquiring rabies.
Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.	No adverse impacts. Potential minor beneficial impact by possibly immunizing wildlife species against rabies.	No impact from being exposed to bait or vaccine. Potential moderate, adverse impacts from continued exposure to and possibility of acquiring rabies.
Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.	No adverse impacts. Potential minor beneficial impact by possibly immunizing domestic animals against rabies.	No impact from exposure to baits or vaccine. Potential moderate, adverse impacts from continued exposure to and possibility of acquiring rabies.
Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.	Negligible risk of adverse impacts.	No impact.
Potential for the V-RG virus to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animal	Negligible risk of adverse impacts.	No impact.
Potential for aerially dropped baits to strike and injure people or domestic animals.	Negligible risk of adverse impacts.	No impact.
Potential effects on NPS wilderness areas	Negligible adverse impacts.	No impact.
Potential impacts on visitor use/experience	Negligible impact from distribution of ORVAC baits. Beneficial impact by reducing the threat of being exposed to a rabid animal.	No impact from distribution of ORVAC baits. Potential moderate, adverse impacts from threat of being exposed to a rabid animal.

Table 3-2. Comparative Summary of Alternatives and Extent to which Each Alternative Meets the Project Objectives.

Alternative 1. Authorize an ORVAC Program – Proposed Action *(this is the preferred alternative)*.	**Alternative 2. No Action.**
This alternative would involve NPS participation in ORVAC programs at NPS units in several states in the eastern U.S. to create zones of vaccinated target species that would then serve as barriers to eliminate and/or cease the further advancement of raccoon rabies virus variants. The NPS units may include the following: Northeast Region's Mid-Atlantic Network Parks: Appalachian National Scenic Trail, GA to ME Eisenhower National Historic Site, PA Gettysburg National Military Park, PA Appomatox Courthouse National Historical Park, VA Booker T. Washington National Monument, VA Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park, VA Petersburg National Battlefield, VA Richmond National Battlefield Park, VA Shenandoah National park, VA Vaccination zones would be determined in cooperation with the involved states' rabies task forces, state health departments, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. The program would involve the use of APHIS-WS federal funds to purchase and distribute ORVAC baits. On an annual basis, one treatment of ORVAC baits could be distributed by aircraft and ground placement on involved NPS units in several states in the eastern U.S. The need to distribute baits on each of the parks would be accessed annually and based on the most current distribution of rabies cases and the expected direction of disease spread. The treatment would continue on a reoccurring basis until the goals of the ORVAC program have been met. **Meets Project Objectives?** Yes. The NPS would assist in stopping the forward advance of the raccoon strain of rabies in the eastern U.S. by immunizing portions of target species populations along the leading edges of the rabies fronts, within the aforementioned NPS units located in several states in the eastern U.S. The NPS would assist in reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans in the areas where the ORVAC programs are conducted.	This alternative would preclude the NPS from any involvement with an ORVAC program at park units located in several states in the eastern U.S. **Meets Project Objectives?** No. The NPS would not assist in stopping the forward advance of the raccoon strain of rabies in the eastern U.S. The NPS would not assist in reducing the incidence of rabies cases in wildlife and domestic animals and rabies exposures to humans.

Appendix B

4.0 CHAPTER 4: AFFECTED ENVIRONMENT

This section presents some descriptive information on the environment of the areas that would be affected by the proposed action. Other descriptive aspects of the affected environment are included in Chapter 4 in the analysis of effects which is based on the environmental and other types of issues identified in section 2.1.

"Major Habitat Types" as described by Ricketts et al. (1999) that encompass the thirteen states (GA, ME, MD, MA, NJ, NH, NY, NC, PA, TN, VA, VT, and WV) that would be affected by ORVAC programs under the proposed action are: Temperate Broadleaf and Mixed Forests and Temperate Coniferous Forests. Appendix E shows the "ecoregions" (i.e., broad level ecosystems) that occur in the potentially affected states (Bailey 1995). Ecoregions in these states range from coniferous and broadleaf forests to riverine forests.

4.1 Potentially Affected NPS Units in the Mid-Atlantic Network Parks Grouping

Appalachian National Scenic Trail, ME to GA

The Appalachian National Scenic Trail is a 2,167-mile (222,521 acres) footpath along the ridge crests and across the major valleys of the Appalachian Mountains from Katahdin in Maine to Springer Mountain in north Georgia. The trail traverses Maine, New Hampshire, Vermont, Massachusetts, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Maryland, West Virginia, Virginia, Tennessee, North Carolina, and Georgia. The Appalachian Trail was opened as a continuous trail in 1937 and designated as the first National Scenic Trail by the National Trails System Act of 1968.

Gettysburg National Military park, PA

Located 50 miles northwest of Baltimore, the small town of Gettysburg, PA was the site of the largest Civil War Battle ever waged in the Western Hemisphere. The Battle of Gettysburg opened on July 1, 1863 and closed two days later with the climactic "Pickett's Charge." It resulted in a Union victory for the Army of the Potomac and successfully turned back the second invasion of the North by General Robert E. Lee's Army of Northern Virginia. Over 51,000 soldiers were killed, wounded or captured making it the bloodiest battle of the Civil War. Historians have referred to the Battle of Gettysburg as the "High Water Mark of the Confederacy." It was the last major effort by Lee to take the fighting out of Virginia and into northern states. It was here that President Abraham Lincoln delivered his immortal Gettysburg Address on November 19, 1863. Post-battle preservation efforts saved small portions of the battlefield as a memorial to the Union victory. On February 11, 1895, congressional legislation was signed to establish Gettysburg National Military Park as a memorial dedicated to the armies that fought the Battle of Gettysburg. Gettysburg National Military Park incorporates nearly 6,000 acres, with 26 miles of park roads and over 1,400 monuments, markers, and memorials.

Eisenhower National Historic Site, PA

The home of former President and Mrs. Dwight D. Eisenhower was designated a National Historic Landmark in April, 1966 and designated a National Historic Site on November 27, 1967. In 1950, the Eisenhower family, purchased the Allen Redding farm adjoining Gettysburg National Military Park. The original 189 acre farm was transformed by stages into the 230 acre country estate of the 34th President of the United States. During his Presidency, President and Mrs. Eisenhower used the farm as a weekend retreat, a refuge in time of illness, and a comfortable meeting place for world leaders. From 1961 to 1969, it was the Eisenhower's home during retirement. In 1967, the Eisenhower family deeded their farm to the U.S. to be administered by the NPS as the Eisenhower National Historic Site, which comprises 690 acres today and is still maintained as a working farm.

Richmond National Battlefield Park, VA

The Richmond National Battlefield was established on March 2, 1936 to commemorate eleven different sites associated with efforts by Union Armies to capture, Richmond, capital of the Confederacy, and end the Civil War. Between 1861 and 1865, Union armies repeatedly attempted to capture Richmond in campaigns such as the battlefields at Gaines' Mill, Malvern Hill, and Cold Harbor. This National Battlefield Park protects 763 acres of historic ground in Richmond, VA.

Petersburg National Battlefield, VA

Petersburg, VA, became the setting for the longest siege in American history when General Ulysses S. Grant failed to capture Richmond in the spring of 1864. Therefore, Grant subdued the Confederacy by surrounding Petersburg and cutting off General Robert E. Lee's supply lines into Petersburg and Richmond. On April 2, 1865, 9½ months after the siege began, Lee evacuated Petersburg. This site was designated a National Military Park on July 3, 1926 and a National Battlefield on August 24, 1962.

Fredericksburg and Spotsylvania National Military Park, VA

The Fredericksburg and Spotsylvania National Military Park was established on February 14, 1927 in memory of the Civil War's tragic cost. More than 85,000 men were wounded and 15,000 killed, most now in graves unknown, in Fredericksburg, Chancellorsville, Wilderness, and Spotsylvania. This battle finally freed 4 million Americans and reunited a nation.

Booker T. Washington National Monument, VA

Booker T. Washington was born into slavery on this 207-acre tobacco farm in April 5, 1856. This National Monument, established on April 5, 1956, memorializes the life and landscape of people who lived in an era when slavery was part of the fabric of American life. The realities of life as a slave in piedmont Virginia, the quest by African Americans for education and equality, and the post-war struggle over political participation all shaped the options and choices of Booker T. Washington. Booker T. Washington founded Tuskegee Institute in Alabama in 1881 and later became an important and controversial leader of his race at a time when increasing racism in the U.S. made it necessary for African Americans to adjust themselves to a new era of legalized oppression.

Shenandoah National Park, VA

Shenandoah National Park encompasses almost 200,000 acres, including almost 80,000 acres of congressionally designated Wilderness, and is visited by more than 1.5 million people per year. It was authorized on May 22, 1926 and fully established on December 26, 1935. The park includes 300 square miles of the Blue Ridge Mountains in the southern Appalachians. Virginia Piedmont is located to the east and the Shenandoah Valley to the west. Two peaks within the park exceed 4,000 feet, creating a mix if habitats from the ranges in elevation, slopes and aspects, rocks and soils, precipitation, and latitude. The park holds more than 500 miles of trails, including 101 miles of the Appalachian Trail.

5.0 CHAPTER 5: ENVIRONMENTAL CONSEQUENCES

Methodology for Assessing Impacts

This section analyzes potential environmental consequences using Alternative 2 (No Action alternative) as the baseline for comparison with the other alternatives to determine if the real or potential impacts are greater, lesser or the same. Table 3-1 summarizes a comparison of the issues and impacts to each alternative.

Potential impacts are described in terms of context (are the effects site-specific, local, or even regional?), duration (short- or long-term?), and intensity (negligible, minor, moderate, or major?). The thresholds of change for the intensity of an impact are defined as follows:

- **Negligible**-the impact is at the lowest levels of detection
- **Minor**-the impact is slight, but detectable
- **Moderate**-the impact is readily apparent
- **Major**-the impact is a severe or adverse impact or of exceptional benefit

In addition to determining the environmental consequences of the preferred and other alternatives, NPS (*Management Policies, 2001*) requires analysis of potential effects to determine whether or not actions would impair park resources.

The fundamental purpose of the National Park System, established by the Organic Act of 1916 and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

Cumulative Impacts. The Council on Environmental Quality (CEQ), which implements the National Environmental Policy Act, requires assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and proposed action alternatives.

Cumulative impacts were determined by combining the impacts of the proposed alternative with potential other past, present, and reasonably foreseeable future actions. Therefore it was necessary to identify other ongoing or foreseeable future projects affecting these units and, if applicable, the surrounding region. No reasonably foreseeable future projects are anticipated which, in combination with the proposed project, may impact the NPS units listed in this document (see Section 1.2 for a list of park units). However, occasional overflights (i.e., radio telemetry, GIS mapping, military training routes) may occur over park units. Overflights for the purposes of

ORVAC bait distribution activities would only occur once per year and aircraft will only fly momentarily over one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. The potential impact would be of short-term duration, on a local scale, with negligible intensity. Therefore, cumulative impacts from the combination of ORVAC bait distribution overflights and other park unit overflights should be negligible (see Chapter 2 for additional information).

5.1 Potential for Adverse Effects on People that Become Exposed to the Vaccine or the Baits

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

Direct tests of the safety of V-RG in humans have not been conducted, for understandable reasons. Prior EAs by APHIS have analyzed in detail the potential for adverse effects on humans from V-RG exposure as a result of ORVAC experimental programs (USDA 1991, 1992).

Potential to Cause Rabies in Humans

The nature of the recombinant virus used as the V-RG vaccine is such that it cannot cause rabies. This is because the V-RG vaccine only carries the gene for producing the outer coating of the rabies virus (i.e., rabies virus *glycoprotein*) and not those portions of the virus that could result in replication of the rabies virus. Replication of the virus would be necessary for the disease to occur.

Implementation of the ORVAC program would reduce the risk of humans contracting rabies by reducing the chance of encountering rabid animals that have been infected by the raccoon variant of the disease.

Potential for Vaccinia Virus to Cause Disease in Humans

The vaccinia virus portion of the V-RG vaccine has been recognized as having the potential to cause infections in persons exposed to the vaccine, either through direct contact with the liquid or through contact with the mouth of an animal that has recently ingested the oral vaccine (USDA 1991, p. 39). Because the vaccinia virus used in the V-RG vaccine is the same type of virus that was used in smallpox eradication, although more *attenuated* or weakened, persons who have been immunized against smallpox would likely not experience any adverse reaction to the vaccinia virus, but would likely experience at worst a "booster" in immunity against vaccinia virus. However, the routine administration of smallpox vaccinations was discontinued after smallpox was eradicated. Thus, a large percentage of the population (particularly younger individuals) has not been vaccinated against vaccinia. Vaccinia virus rarely poses much risk of serious health effects – even when it was *directly applied* (via "scarification" or by scratching the skin) to many hundreds of millions of people during smallpox eradication campaigns, the number that developed vaccinia virus-related illness was only a few per million. In most of those cases the extent of the illness was a mild fever and some lesions or pustules at the site of the injection, followed by full recovery and subsequent immunity to the vaccinia virus (USDA 1991, p. 39; Elvinger 2001). In most people, localized lesions occurred around the site on the arm where the smallpox vaccine was applied, but this a normal and expected response and, in general, no cause for concern.

More severe complications involving the central nervous system (CNS) can occur with vaccinia virus and are generally thought to be allergic in nature (USDA 1991, p. 39). CNS complications occurred at an average rate of 3 per million among persons vaccinated with vaccinia virus (e.g., to prevent smallpox) with about 10 to 30 percent of those cases resulting in death (USDA 1991, p. 39). Thus, the chance of a person dying from direct application of a high dose of vaccinia virus via scarification would be about 1 in a million cases or less. With ORVAC baits distributed in the wild, people would run far less risk of being exposed to vaccinia virus or the V-RG vaccine in a way similar to deliberate smallpox vaccinations, but would primarily only run the risk of skin contact by handling broken baits or coming into contact with the oral regions of pets that had just consumed a bait. For that type of exposure, the chance of adverse effects from human infection with vaccinia virus would be far less than 1 in a million.

Another highly important characteristic of the V-RG vaccine is that it is weaker (more "attenuated") than the original parent vaccinia strain used in making it (USDA 1991, p. 18-19). This characteristic even further reduces the risk of V-RG vaccine causing vaccinia-related illness in humans.

Persons with immune system deficiencies (e.g., AIDS) run a relatively greater risk of experiencing adverse effects if directly exposed to the vaccinia virus than would persons with normal immune systems (USDA 1991, p. 40; USDA 1995a; USDA *undated a and undated b*). Experiments in mice suggest that immune-deficient people would be at minimal risk of adverse effects when exposed to V-RG vaccine (Hanlon et al. 1997; USDA 1991, p. 41 and Appendix E therein). To aid in further minimizing the potential for adverse effects on humans because of contact with V-RG vaccine, each ORVAC bait contains a warning label advising persons who make contact with baits or the vaccine liquid to contact officials. A telephone number is provided on the bait for further guidance.

An indirect source of information on this issue is the safety record of laboratories that have worked with the V-RG vaccine (USDA 1991, p. 27). Ordinarily, lab personnel working with infectious materials or animals are protected by immunization and by procedures and equipment that minimize risk. V-RG vaccine has been completely safe for humans in laboratory situations (USDA 1991, p. 27). Potential non-laboratory exposure of humans in the various European field trials of V-RG vaccine has been considerable, with no program in place that monitors antibody levels of residents before and after the field trials. However, there have not been any reports of increased incidence of sickness in the field trial areas that could be attributable to the V-RG vaccine (USDA 1991, p. 27; Moore, TX Dept. of Health, pers. comm. 2001 *in* USDA 2001a).

Studies of the effects of V-RG vaccine on nonhuman primates can provide an indication of the potential to affect humans (USDA 1991, p. 27). Studies in which squirrel monkeys (*Saimiri sciureus*) and chimpanzees (*Pan troglodytes*) were inoculated with the V-RG vaccine demonstrated that indirect human exposure to the vaccine that might occur via a bite or from contact with body fluids of a recently vaccinated animal is unlikely to produce adverse effects in healthy individuals (Rupprecht et al. 1992b; USDA 1991, p. 27).

McGuill et al. (1998) conducted a retrospective 4-year survey of directors of five ORVAC programs that used the V-RG vaccine from 1992-1996 to evaluate the potential for human health problems. The programs occurred in Florida, Massachusetts, New Jersey, New York, and Texas. Altogether, they involved a total of 42,181 sq miles of treated area and a total of nearly 6 million baits distributed. Human contacts with the baits totaled 316, of which 53 resulted in contact with the actual vaccine liquid. The directors of all programs reported that human contact was minimal and that there were no reported adverse reactions in people exposed to the baits. Human contact with the baits was more likely in areas where bait had white labels vs. lettering in black ink, and the authors speculated the reason to be because the white labeled baits were more visible and thus more likely to be noticed. The authors concluded that, based on their survey, major concerns about public health risks from V-RG vaccine were unfounded.

Out of approximately 43.75 million baits disbursed since APHIS-WS ORVAC program inception in 1995, only 576 people reported contacting or potentially contacting a bait (i.e., picking up bait, finding a bait in yard, or removing bait or sachet from pet's mouth, feces, or vomit - any type of contact with a bait is also defined throughout the document as an "exposure"). This equates to one human exposure per 75,955 baits distributed (0.0013 percent contact cases). In addition, exposure cases were generally insignificant as most involved finding an intact bait. Very few cases involved touching a broken bait, sachet, or liquid vaccine. Furthermore, of the 0.0013 percent of contact cases reported since APHIS-WS ORVAC program inception in 1995, only one known adverse reaction has occurred (USDA 2004d, 2004b).

The adverse reaction occurred in Ohio in September, 2000, when a woman was bitten by her dog while trying to take away an ORVAC bait. The vaccine liquid was exposed to the bite area, resulting in localized inflammation and pox virus lesions at the site of the bite, as well as a whole body rash. She further experienced sloughing of the outer layers of skin from some portions of her body, similar to what occurs in the skin condition eczema (C. Rupprecht, CDC, pers. comm. 2001). The woman, who was in her first trimester of pregnancy, is reported to have recovered from complications and gave birth to a 10-lb. baby boy with no apparent adverse health effects (R. Krogwold, OH Dept. of Health, pers. comm. 2001). Most recent reports attribute her response to the vaccinia virus as likely due to the reduced state of immunity typical during pregnancy and an underlying skin disorder (epidermolytic hyperkeratosis) that the woman already had (C. Rupprecht, CDC, pers. comm. 2001). The woman also tested positive for rabies antibodies three weeks after the exposure, indicating she may also have developed rabies immunity (Rupprecht et al. *unpublished* 2001, Rupprecht et al. 2001). A lawsuit was filed in 2001 and a judgment was determined in favor of the defendant, the Ohio Department of Health, in May 2003. This type of incident

appears to be unusual, but, nevertheless, points to the need for continued public information and education activities and field surveillance for accidental human exposure to the V-RG virus.

Recent bait exposure information during an ORVAC project in western Pennsylvania (August-September, 2003) revealed that out of 1,710,399 baits distributed over approximately 25,189 km^2, 190 humans or pets were exposed to a bait. This equates to one exposure per 9,002 baits disbursed or 0.011 percent of distributed baits being found by pets or people. In at least 69 of the 190 potential contact cases, the household pet (dog or cat) found the bait; however, the bait and sachet or sachet alone was normally still intact (at least 91 percent of cases). Of the six cases where the sachet was ruptured, no reports were submitted regarding the development of an adverse reaction (i.e., lesions) (USDA 2004b). This ORVAC project involved hand baiting in several urban areas such as Allegheny County, and aerial baiting of the rural areas. Therefore, pets and other domestic animals were more likely to find the baits and are the primary source for potential and human exposure to ORVAC baits. Most ORVAC baiting locations occur over rural or undeveloped lands where human exposure cases can be expected to be much lower.

Although there is no approved anti-viral compound available yet for treatment of suspected vaccinia virus complications, the CDC can make vaccinia immune globulin available to states on a case-by-case basis, with a requirement that certain specimens (such as acute and convalescent sera and swabs/scabs of the affected site) be collected for diagnosis (C. Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001a). This option provides some level of additional assurance that severe adverse effects on humans from vaccinia virus reactions would be successfully treated to avoid significant public health problems.

A recent study indicates vaccinia virus that originated from a strain used in smallpox vaccinations in Brazil may have become established in domestic cows in that country (Damaso et al. 2000). This indicates there is some potential for the use of vaccinia virus to result in a new emerging infectious disease. There is currently no evidence that this type of phenomenon has occurred in the U.S. (C. Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001a). Also, the vaccinia virus strain used for smallpox vaccination in Brazil was different than the strain that is currently used in the V-RG vaccine, and the vaccinia virus portion of V-RG is more attenuated (i.e., *weaker*) than the strains used in smallpox vaccines (USDA 1991, p. 18-19). Thus, it is less likely that V-RG vaccine would result in the establishment and persistence of vaccinia virus in wild or domestic animals. However, no surveillance or testing of animals for this virus has been done in the U.S. to test this hypothesis (C. Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001a).

The above information shows there is some potential for unusual circumstances to result in short-term adverse health effects from exposure to the vaccinia virus in the V-RG vaccine. However, the overall risk of such effects appears to be negligible based on the extremely low rate of reported occurrences in ORVAC programs.

Potential to Cause Cancer (Oncogenicity)

This issue has been addressed in a previous EA and in formal risk analyses (USDA 1991, p. 40; USDA *undated a and undated b*). Vaccinia virus is not known to be a tumor-inducing virus. There have been no documented reports of oncogenicity associated with natural vaccinia virus infections in any animal species. The recombinant DNA methods used for preparation of the V-RG vaccine do not introduce any known oncogenes (i.e., cancer-causing genes) into the vaccinia virus strain that could cause it to become tumor-inducing.

Cumulative Impacts: Cumulative impacts of the proposed ORVAC program would likely be beneficial given that the possibility of humans becoming exposed to raccoon variant of the rabies virus would be reduced with this program. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to humans. A limited number of baits would be distributed one time per year on an annual basis, thereby limiting the amount of exposure a person may have to an ORVAC bait or bait distributing equipment. Cumulative impacts to humans would likely be beneficial. Any adverse impacts to humans from exposure to the vaccine or baits would be negligible.

Conclusion: Based on this information, risks to humans from contact with the V-RG vaccine are believed to be negligible. The risk and potential severity of adverse effects from rabies exposures in humans would probably be greater without ORVAC programs than would be the risk of serious adverse effects from vaccinia virus infections with ORVAC programs. Implementation of an ORVAC program would likely have a beneficial impact to humans.

This alternative would support the thirteen eastern states (see section 1.2) in the effort of reducing or possibly eliminating of this strain of the virus from the U.S.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

Potential to Cause Rabies in Humans

The risk of humans being exposed to the vaccine or baits would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2). The no action alternative would most likely result in greater risk of human exposure to rabies than the proposed action because the involved state ORVAC programs would have less chance of being successful in stopping or preventing the spread of the raccoon rabies variant.

Potential for Vaccinia Virus to Cause Disease in Humans

This risk would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Potential to Cause Cancer (Oncogenicity)

This risk would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in human exposure to the raccoon variant of the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in moderate, adverse cumulative impacts to humans. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: There would be no direct impact to humans as ORVAC baits would not be distributed and humans would, therefore, not be exposed the vaccine or baits. However, there could be an indirect adverse cumulative impact from increased human exposure to the raccoon variant of the rabies virus. This alternative would not support the efforts of several eastern states in reducing or eliminating this strain of the virus from the U.S.

5.2 Effects of the ORVAC V-RG Vaccine on Raccoons

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The primary concern here is whether the V-RG virus may cause disease in raccoons that consume ORVAC baits. Large numbers of raccoons have been inoculated with, or have consumed baits containing, the vaccine without ill effects, and most were successfully immunized against rabies (USDA 1991, p. 25; Rupprecht et al.1986). Tests showed that the V-RG virus did not invade the CNS or the cerebrospinal fluid of treated raccoons which indicated no adverse effects on the CNS is likely (USDA 1991, p. 25; Hanlon et al. 1989b). Other tests showed that the V-RG vaccine did not cause any lesions or viremia (i.e., presence of the virus in the blood) in tissues sampled from treated raccoons (Rupprecht et al. 1988). These studies, in addition to the absence of reports of adverse effects in free-ranging wildlife in current/historical ORVAC program areas, have demonstrated the safety and effectiveness of the V-RG vaccine in raccoons. ORVAC baits containing the V-RG vaccine would thus have no adverse impact on raccoon populations.

Cumulative Impacts: Cumulative impacts would likely be beneficial as the proposed ORVAC program would reduce the possibility of raccoons becoming infected with the rabies virus. The ORVAC vaccine and bait that would be used has been found safe to use on raccoons. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to raccoons. Cumulative impacts to raccoons would likely be beneficial as those raccoons that consume baits would likely be vaccinated against the rabies virus.

Conclusion: Adverse impacts to raccoons from contact with the V-RG vaccine are believed to be negligible. Implementation of an ORVAC program would likely have a beneficial impact to raccoons by reducing the occurrence of the raccoon variant of the rabies virus in the wild. This alternative would support the several aforementioned states (see section 1.2) in the effort of reducing or possibly eliminating of this strain of the virus from the U.S.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

The potential effects of raccoons being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in raccoon exposure to the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in moderate, adverse cumulative impacts to raccoons. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: There would be no direct impact to raccoons as ORVAC baits would not be distributed and raccoons would, therefore, not be exposed to the vaccine or baits. However, there could be an indirect moderate adverse cumulative impact from increased animal exposure to the raccoon variant of the rabies virus. This alternative would not support the efforts of several eastern states (see section 1.2) in reducing or eliminating this strain of the virus from the U.S.

5.3 Potential for Adverse Effects on Nontarget Wildlife Species, including Threatened or Endangered Species

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The primary concern here is whether the vaccinia virus-rabies glycoprotein combination (i.e., RABORAL V-RG® vaccine) might cause disease in nontarget animals that consume or otherwise come into contact with the vaccine. Rupprecht et al. (1992a) and Pastoret et al. (1995) summarized the results of V-RG safety trials in nontarget species. More than 50 species from Europe and North America have been tested and include relevant taxonomic groups believed to be potentially at risk for contact with the V-RG vaccine such as:

- Natural ecological competitors of foxes, such as raccoons (*Procyon lotor*), opossum (*Didelphis virginianus*), several mustelids [skunk, badger (*Taxidea taxus*), mink (*Mustela vision*), otter (*Lutra canadensis*), ferret (*Mustela putorius*)], other members of the Canid family [coyote, red fox, gray fox, arctic fox (*Alopex lagopus*), raccoon dog (*Nyctereutes procyonoides*)], bobcat (*Lynx rufus*), and black bear (*Ursus americanus*).
- Domestic cats (*Felix domesticus*) and dogs (*Canis familiaris*).
- 19 rodent species (Order *Rodentia*) that might be expected to gnaw on or consume baits. Families within this order represented in the studies included: *Muridae, Erethizonidae* [porcupine (*Erithizon dorsatum*)], *Sciuridae, Cricetidae,* and *Zapodidae*.
- 1 bat species [Daubenton's bat (*Myotis daubentoni*)].
- 8 bird species, including three hawk species [red-tailed hawk (*Buteo jamaicensis*), kestrel (*Falco tinnunculus*), common buzzard (*B. Buteo*)], and one species each of owl [great horned owl (*Bubo virginianus*)], crow [carrion crow (*Corvus corone*)], gull [ring-billed gull (*Larus delawarensis*)], magpie (*Pica pica*), and jay (*Garrulus glandarius*).
- Domestic livestock [cattle (*Bos taurus*), sheep (*Ovis ovis*)].
- Two wild ungulate species [wild boar (*Sus scrofa*) and white-tailed deer (*Odocoileus virginianus*)].

- Two primate species (squirrel monkey and chimpanzee).

Rupprecht et al. (1992a) reported there has been no mortality or morbidity (i.e., signs or symptoms of disease) and no lesions typical of pox virus infections caused by V-RG vaccine in over 350 individual animals representing some 20 taxonomic families of animals. They concluded that the extensive laboratory safety experiments showed V-RG to be safe in all species tested to date. In field trials with V-RG ORVAC baits to treat wild raccoons in which target and nontarget species were captured and tested, no vaccine-related lesions or other adverse effects have been found to occur (Rupprecht et al. 1992a). The ORVAC program would reduce the likelihood of wildlife being exposed to the rabies virus.

There is no evidence of potential harm to target or nontarget species from overdosage of RABORAL V-RG® vaccine by any route or from multiple doses. A number of nontarget species have been dosed with 2 to 10 times the amount of vaccine in an individual ORVAC bait without adverse effects (USDA 1991, p. 47; Rupprecht et al. 1992a). Therefore, even if domestic animals received multiple doses of vaccine by consuming multiple baits, no adverse effects would be expected to occur.

The RABORAL V-RG® vaccine would not adversely affect any non-warm blooded animal species. The vaccinia virus and other orthopoxviruses do not replicate or reproduce themselves in non-warm blooded species (C. Rupprecht, CDC, pers. comm. 2002). Therefore, ORVAC is not expected to cause any adverse effects on fish, reptiles, amphibians, or any invertebrate species should any members of these groups consume or otherwise be exposed to the vaccine.

With regard to threatened or endangered species, the RABORAL V-RG® vaccine distributed in baits would have no adverse effects on any federal- or state-listed threatened or endangered species or their critical habitats (see Appendix C and D for species lists). Several federal- and state-listed carnivore species (listed below) occur within the states listed under the proposed action. These species may be attracted to ORVAC baits. If these carnivore species came in contact with and consumed an ORVAC bait it would be expected that they would experience no effect other than possibly becoming immunized against rabies.

Federally Listed T&E Species (USDI 2004b):

- **Canada Lynx** (*Lynx canadensis*). This species is shown to potentially occur in portions of New York, Pennsylvania, New Hampshire, Maine, and Vermont among the states involved in the proposed action). The USFWS has documentation that lynx occur and are reproducing in Maine and therefore believes that lynx could possibly disperse to contiguous suitable habitat in New Hampshire, but consider lynx occurrence as rare in New Hampshire based on recent records (USDI 2000a). Furthermore, the USFWS considers it possible that lynx have been extirpated from New Hampshire, Vermont and New York (USDI 2000a). The USFWS has concluded that, in the Northeast, a population of lynx most likely continues to exist in the core region of western Maine, northern New Hampshire, southeastern Quebec, and western New Brunswick; however, the range appears to have retracted northward (USDI 2000a). Lynx are not expected to be attracted to or to consume ORVAC baits and would thus not be affected by them. Therefore, APHIS-WS has determined that the proposed action would have no effect on this species. A potential beneficial indirect impact of ORVAC programs on lynx conservation would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the variant strain is eliminated.

- **Gray Wolf** (*Canis lupus*). **Eastern Distinct Population Segment (DPS) of the Gray Wolf.** On April 1, 2003 this segment of the gray wolf population was reclassified as threatened (previously considered endangered under the ESA). The Eastern gray wolf DPS encompasses the historical range of the gray wolf from the Great Plains to the Atlantic Coast. Due to the successful gray wolf recovery in Minnesota, Wisconsin, and Michigan, this DPS is now classified as Threatened. This species may be attracted to or consume ORVAC baits; however, the only effect of the baits on this species would be possible vaccination from rabies. A potential beneficial indirect impact of ORVAC programs would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the raccoon variant strain is eliminated.

- **Eastern Puma** (*Puma concolor couguar*). This species is designated as endangered in its entire historical range

(Connecticut, District of Columbia, Delaware, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Maine, Michigan, North Carolina, Georgia, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Vermont, and West Virginia). The Eastern puma is presumed extinct in the wild; however, some unconfirmed sightings have been reported in Minnesota and Michigan recently (http://endangered.fws.gov/). The USFWS and USFS jointly completed a 5-year survey in an attempt to determine the presence of self-sustaining cougar populations in the southern Appalachian Mountains from Virginia to Northern Georgia. No concrete evidence was ever obtained for the existence of eastern cougar populations (per http://endangered.fws.gov/). This species is not expected to be attracted to or to consume ORVAC baits. Therefore, ORVAC programs would have no effect on this species. A potential beneficial indirect impact of ORVAC programs on this species would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the variant strain is eliminated.

- **Virginia Northern Flying Squirrel** (*Glaucomys sabrinus fuscus*). This species is federally-listed as endangered in Virginia and West Virginia. It is conceivable that this species could consume ORVAC baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate flying squirrels would not be adversely affected. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

- **Red Wolf** (*Canis rufus*). The historic range of the red wolf occurred throughout the southeastern U.S. from the Atlantic Coast to central Texas and from the Gulf of Mexico to central Missouri. Red wolves are listed as endangered in Florida and North Carolina. However, red wolves are now considered to be extinct in the wild. Experimental populations of red wolves were introduced to the Great Smoky Mountains National Park in Tennessee, but the program was terminated in 1997 and all wolves were removed from the park. If any remaining red wolves are found in the wild, a potential beneficial indirect impact of ORVAC programs on this species would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

- **Carolina Northern Flying Squirrel** (G*laucomys sabinus coloratus*). This species is listed as endangered in the Great Smoky Mountains National Park. It is conceivable that this species could consume ORVAC baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate flying squirrels would not be adversely affected. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **Delmarva Fox Squirrel** (*Sciurus niger cinereus*). This species is listed as endangered in Maryland and Virginia. It is conceivable that this species could consume ORVAC baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate fox squirrels would not be adversely affected. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

State listed species:

- **Canada Lynx** (*Lynx canadensis*). This species is state-listed as endangered in New Hampshire and Vermont and threatened in New York. This species was discussed in detail in the Federally Listed T&E Species section.

- **Bobcat** (*Lynx rufus*). The bobcat is state-listed as endangered in New Jersey and "in need of conservation" in Maryland. ORVAC baits distributed for raccoons would not adversely affect this species (Rupprecht et al. 1992a). An indirect beneficial effect would be a reduced risk of these species suffering further declines in the state because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species. Therefore, the proposed action should have no adverse impact on this species.

- **Eastern Puma** (*Puma concolor couguar*). This species is state-listed as endangered in Georgia, New York,

North Carolina, Vermont, and Virginia. This species was discussed in detail in the Federally Listed T&E Species section.

- **Gray Wolf** (*Canis lupus*). This species is state-listed as endangered in New York and Virginia. This species was discussed in detail in the Federally Listed T&E Species section.

- **Northern River Otter** (*Lutra canadensis*). The river otter is state-listed as a "species of concern" in Virginia. ORVAC baits distributed for raccoons would not adversely affect this species (Rupprecht et al. 1992a). An indirect beneficial effect would be a reduced risk of these species suffering further declines in the state because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

- **Delmarva Fox Squirrel** (*Sciurus niger cinereus*). This species is state-listed as endangered in Pennsylvania, Maryland, and Virginia. Although not specifically tested for safety in these species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate fox squirrels would not be adversely affected if they were to consume ORVAC baits. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **Virginia Northern Flying Squirrel** (*Glaucomys sabrinus fuscus*), **West Virginia Northern Flying Squirrel** (*Glaucomys sabrinus fuscus*), **and Carolina Northern Flying Squirrel** (*Glaucomys sabrinus coloratus*). The Virginia northern flying squirrel is state-listed as endangered in Virginia. The West Virginia northern flying squirrel is state-listed as a "species of concern" in West Virginia. The Carolina northern flying squirrel is state-listed as endangered in North Carolina. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate flying squirrels would not be adversely affected if they were to consume ORVAC baits. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **Round-tailed Muskrat** (*Neofiber alleni*). This species is state-listed as threatened in Georgia. It is conceivable that this species could consume ORVAC baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related rodents (Rupprecht et al. 1992a) indicate muskrats would not be adversely affected. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **North American Porcupine** (*Erethizon dorsatum*). This species is state-listed as "in need of management" in Maryland. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate this species would not be adversely affected if they were to consume ORVAC baits. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **American Marten** (*Martus americana*). This species is state-listed as threatened in New Hampshire and endangered in Vermont. It is conceivable that this species could consume ORVAC baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related Mustelid species (skunk, mink, badger, ferret, otter) (Rupprecht et al. 1992a) indicate martens would not be adversely affected. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

- **Least Weasel** (*Mustela nivalis*). This species is state-listed as "in need of management" in Maryland. It is conceivable that this species could consume ORVAC baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related Mustelid species (e.g., skunk, mink, badger, ferret, and otter) (Rupprecht et al. 1992a) indicate weasels would not be adversely affected if they were to consume ORVAC baits. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this

species.

- **Eastern Spotted Skunk** (*Spilogale putorius*). This species is state-listed as a "species of concern" in West Virginia. It is conceivable that this species could consume ORVAC baits intended for raccoons. Safety studies on skunks (Rupprecht et al. 1992a) indicate this species would not be adversely affected if they were to consume ORVAC baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **New England Cottontail** (*Sylvilagus transitionalis*). This species is state-listed as "in need of conservation" in Maryland and a "species of concern" in New York and Vermont. This species is not expected to be attracted to or to consume ORVAC baits. Therefore, ORVAC programs would have no effect on this species. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

- **Snowshoe Hare** (*Lepus americanus*). This species is state-listed as endangered in Virginia. Hares would not likely be attracted to or consume ORVAC baits. Therefore, ORVAC should have no effect on this species. An indirect beneficial effect would be a reduced risk of this species suffering further declines in the state because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

- **Appalachian Cottontail** (*Sylvilagus obscurus*). This species is state-listed as a "species of concern" in West Virginia. Cottontails would not likely be attracted to or consume ORVAC baits. Therefore, ORVAC should have no effect on this species. An indirect beneficial effect would be a reduced risk of this species suffering further declines in the state because of a rabies epizootic. Therefore, the proposed action should have no adverse impact on this species.

- **Marsh Rabbit** (*Sylvialagus palustris*). The marsh rabbit is state-listed as a "species of concern" in Virginia. Rabbits would not likely be attracted to or consume ORVAC baits. Therefore, ORVAC should have no effect on this species. An indirect beneficial effect would be a reduced risk of the species contracting and dying of rabies. Therefore, the proposed action should have no adverse impact on this species.

The proposed action would have no effect on any of the other listed species in the states involved in the proposed action (see Appendices C and D).

The USFWS – Division of Migratory Birds in Hadley, MA (NE Regional Office) reviewed the proposed ORVAC program and determined the program would have no negative impacts to migratory birds.

The USFWS Ecological Services offices in each of the states listed under the proposed action and the USFWS NE Regional Office have reviewed the proposed ORVAC program and have concurred that the proposed program is not likely to adversely affect any T&E species or their critical habitats. However, the USFWS NJ Field Office supervisor stated in informal consultation that aerial overflights may adversely affect the federally listed (threatened) bald eagle on or adjacent to the Appalachian National Scenic Trail in NJ if activities are conducted during the nesting season. The USFWS stated that even single passes of low-flying aircraft can cause abandonment of eagle nests or injury to flightless young. To ensure that nesting bald eagles are not adversely affected by low-flying aircraft, the USFWS recommends that flights maintain a minimum vertical distance of 1,500 feet above ground level in the vicinity of the nest sites or at least 1 mile lateral distance from the nest sites. If aerial distribution of baits occurs during the nesting season, the USFWS requests bait disbursal activities be coordinated with the USFWS NJ Field Office 30 days prior to bait distribution to obtain a current list of eagle nest locations that may be affected by use of low-flying aircraft. The USFWS believes ground distribution of baits during the bald eagle nesting period or aerial distribution of baits outside the nesting season are unlikely to adversely affect nesting eagles.

Precautions would be taken to avoid disturbance of known sites containing nesting bald eagles. However, no evidence has been found to indicate harm to eagles or other raptors as the result of an annual overflight. ORVAC flights would not be chronic, but would only occur momentarily over any one site and only once per year. Thus, any direct disturbances would only be momentary in nature and would not be numerous. In addition, the annual

overflight is even less likely to adversely impact migratory birds if/when flights occur in the fall after the birds have dispersed. Therefore, impacts from ORVAC bait distribution overflights should be negligible.

The involved state (GA, ME, MD, MA, NH, NJ, NY, NC, PA, TN, VT, VA, and WV) wildlife agencies have reviewed the proposed ORVAC program and have indicated that the proposed program will have no anticipated negative impacts to rare or natural communities or state-listed wildlife species.

Cumulative Impacts: There would be no adverse cumulative impacts of the proposed ORVAC program on nontarget wildlife species, including any state or federally listed threatened or endangered species. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to nontarget wildlife species. Cumulative impacts to nontarget wildlife could possibly be beneficial as those species that consume baits may become vaccinated against the rabies virus. Additionally, the proposed program would reduce the likelihood of nontarget wildlife coming into contact with an animal infected with the rabies virus.

Conclusion: The RABORAL V-RG® vaccine distributed in baits would have no adverse effects on nontarget wildlife species, including any state or federally listed threatened or endangered species. Implementation of an ORVAC program would likely have a minor beneficial impact by possibly immunizing other wildlife species against the raccoon variant of rabies and by reducing the likelihood of becoming exposed to an animal infected with the rabies virus. This alternative would support thirteen eastern states (see section 1.2) in the effort of reducing or possibly eliminating of this strain of the virus from the U.S.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

The risk of a nontarget wildlife species being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on NPS units in the aforementioned thirteen eastern states (see section 1.2).

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in exposure of nontarget wildlife to the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in minor, adverse cumulative impacts to other wildlife species. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of a nontarget wildlife species being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2). However, failure to stop or prevent the spread of rabies would result in adverse effects on wildlife by increasing the likelihood of exposure to an animal infected with the rabies virus. This alternative would not support the efforts of the aforementioned states in reducing or eliminating this strain of the virus from the U.S.

5.4 Potential for Adverse Effects on Pet Dogs or Other Domestic Animals that Might Consume the Baits

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

Rupprecht et al. (1992a) and Pastoret et al. (1995) summarized the results of V-RG safety trials in nontarget species. These studies included the oral vaccination of domestic dogs, cats, cattle, and sheep and found no adverse effects on these species. More than 43.75 million ORVAC baits using the RABORAL V-RG® vaccine have been distributed in the U.S. during the APHIS-WS program thus far with no reported adverse effects on domestic animals. There is no evidence of potential harm to target or nontarget species, including domestic dogs, cats, cattle, and sheep, from overdosage of RABORAL V-RG® vaccine by any route or from multiple doses. A number of nontarget species have been dosed with 2 to 10 times the amount of vaccine in an individual ORVAC bait without adverse effects

(USDA 1991, p. 47; Rupprecht et al. 1992a). Therefore, even if domestic animals received multiple doses of vaccine by consuming multiple baits, no adverse effects would be expected to occur.

As discussed in section 4.1, a recent study indicates vaccinia virus that originated from a strain used in smallpox vaccinations in Brazil may have become established in domestic cows in that country (Damaso et al. 2000). This indicates there is some potential for use of vaccinia virus in vaccinations to result in a new emerging infectious disease in domestic animals; however, there is currently no evidence that this type of phenomenon has occurred in the U.S. (C. Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001a). Also, the vaccinia virus strain used for smallpox vaccination in Brazil was different than the strain that is currently used in the V-RG vaccine. The vaccinia virus portion of V-RG is more attenuated (i.e., *weaker*) than strains used in smallpox vaccines (USDA 1991, p. 18-19). Thus, it is less likely that V-RG would result in the establishment and persistence of vaccinia virus in wild animal populations.

Instances have been reported where a pet dog has consumed several baits and then vomited the plastic sachets (R. Hale, Ohio Dept. of Health, pers. comm. 2001). Reports of these types of instances have been few, and the dogs have reportedly not experienced any substantive or long term adverse effects. USDA (2004b) documented that of the 43.75 million baits distributed during the APHIS-WS ORVAC program between 1995 and 2003 only 424 instances have been reported where a pet or other domestic animal had contact with a bait. This equates to 1 domestic exposure per 103,184 baits disbursed or 0.00096 percent contact cases. No cases of adverse reaction in pets or other domestic animals have ever been reported during the APHIS-WS program. In addition, USDA (2004b) documented that 146 incidents were reported where pets came into contact with a bait in 2003; however, no reports of pets or other domestic animals experiencing any type of adverse reaction were submitted. Domestic animals that bite into and ingest a bait are most likely to be immunized against rabies or receive a boost from a previous vaccination. USDA (2004b) also documented the number of baits distributed in those states conducting ORVAC programs and the number of people who reported contact or potential contact with a bait by their pet or other domestic animal (i.e., carrying bait in mouth, chewing bait, vomiting sachet). The number of documented exposures equates to 0.0014 percent of the 10.26 million baits distributed in 2003 or one domestic animal exposure per 70,252 baits distributed. The domestic animals reported to have been exposed to a bait involved 122 dogs, 6 cats, 1 cow, 1 horse, 1 alpaca, and 15 unknown/unidentified animals. In the monitoring report (USDA 2004b), APHIS-WS concluded that adverse cumulative impacts to pets and other domestic animals continue to be negligible.

Cumulative Impacts: There would be no adverse cumulative impacts of the proposed ORVAC program on pet dogs or other domestic animals. The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to these animals. Cumulative impacts to pets and other domestic animals could possibly be beneficial as those species that consume baits may become vaccinated against the rabies virus. Additionally, the proposed program would reduce the likelihood of pets and other domestic animals coming into contact with an animal infected with the rabies virus.

Conclusion: The RABORAL V-RG® vaccine distributed in baits would have no adverse effects on pets or other domestic animals. Implementation of an ORVAC program would likely have a moderate beneficial impact by possibly immunizing these animals against rabies and reducing the likelihood of becoming exposed to an animal infected with the rabies virus. This alternative would support the thirteen eastern states (see section 1.2) in the effort of reducing or possibly eliminating of this strain of the virus from the U.S.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

The risk of a pet dog or domestic animal being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).
Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in exposure of pets and other domestic animals to the rabies virus. Reservoirs of the virus could remain in untreated areas making the total elimination of this strain of the virus highly unlikely. This alternative could result in moderate, adverse cumulative impacts to pets and other domestic animals. No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of a pet dog or domestic animal being exposed to the V-RG vaccine would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2). However, failure to

stop or prevent the spread of rabies would result in adverse effects on domestic animals by increasing the likelihood of exposure to rabid wild animals. This alternative would not support the efforts of the aforementioned states in reducing or eliminating this strain of the virus from the U.S.

5.5 Potential for the Recombined V-RG Virus to "Revert to Virulence" and Result in a Virus that Could Cause Disease in Humans or Animals

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The concern here is whether the V-RG recombinant virus is genetically stable so that it would not become virulent (i.e., capable of causing disease) after it replicates (or reproduces) in animals that consume ORVAC baits containing the RABORAL V-RG® vaccine and, perhaps, be transmitted on to other animals. This issue was addressed in previous EAs and in formal risk assessments by USDA, APHIS (USDA 1991, p. 41-42; USDA *undated a and undated b*). The Wistar Institute conducted experiments with mice in which the V-RG was "subpassaged[5]" four times into groups of mice (results cited in USDA 1991, p. 41). The V-RG virus could not be found after passage through the second or third groups of mice. These experiments demonstrated that the ability of the V-RG virus to cause disease does not increase by repeated animal passage, thus "reversion to virulence" is unlikely. Further alleviating the concern about this issue is the evidence that V-RG virus does not transmit readily to other animals from animals that have consumed ORVAC baits (Rupprecht and Kieny 1988).

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for the recombined V-RG virus to "revert to virulence" would be negligible.

Conclusion: The potential for the recombined V-RG virus to "revert to virulence" would be negligible. The RABORAL V-RG® vaccine distributed in baits would have no adverse effects on humans or animals.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

This risk would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of the recombined V-RG virus "reverting to virulence" would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

5.6 Potential for the RABORAL V-RG® Vaccine to Recombine with Other Viruses in the Wild to Form New Viruses that Could Cause Disease in Humans or Animals

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

The concern here is whether the RABORAL V-RG® vaccine in the ORVAC baits might encounter other viruses in animals, exchange genetic material with them during replication, and result in new viruses that could cause serious diseases in humans or animals. This potential recombination has been recognized as being more probable with wild pox viruses that are genetically similar to the vaccinia virus used as the vector in the RABORAL V-RG® vaccine.

[5] This means the V-RG was inoculated into one group of mice from which material containing the virus was obtained later and injected into a second group of mice, and then material obtained from the second group was injected into a third group, etc., until four such passages had been conducted.

Wild pox viruses present in the U.S. include skunk, rodent, and raccoon pox (RP) viruses (C. Rupprecht, CDC, pers. comm. 2001 *in* USDA 2001a). RP has not been found to be prevalent in the environment, with only two concurrent isolations (or detections) of it having occurred in the U.S. (Herman 1964, cited in USDA 1991, p. 42).

For these types of unanticipated spontaneous recombinations to occur, the V-RG and RP would have to simultaneously infect the same cells in the same animal at the same time. The Wistar Institute identified three circumstances that would have to occur simultaneously for there to be a chance of a hazardous recombination between V-RG and RP virus: (1) they would have to occur at the same time in the same animal; (2) "genome contact" (i.e., contact between the actual genetic material in the two viruses as they replicate in an infected cell); *and* (3) the regeneration of the gene that was previously removed from the vaccinia virus (known as the thymidine kinase "TK" gene) (USDA 1991, p. 42). Wistar determined the probability of all three circumstances occurring at the same time was 1 chance in 100 million or less (USDA 1991, p. 42). Also, if this did somehow occur resulting in a recombined virus with the functional "TK" gene reestablished, the properties and virulence of the new virus would probably be similar to the original recipient virus which is vaccinia (USDA *undated b*, p. 28). Vaccinia only causes mild short-term symptoms in most cases (i.e., similar to the localized rash and pustules that occurred on the arms of many persons who received smallpox vaccinations) (USDA 1991, p. 39; Elvinger 2001). Thus, recombination with wild viruses is unlikely, but, if it did occur, it is also unlikely to result in significant adverse effects on animals or people. Laboratory experiments on mice infected with RP and inoculated with V-RG showed no adverse effects on the mice (USDA, 1991, p. 42).

Combination of two types of pox viruses in rabbits or hares (leporipoxviruses) has been known to occur (Omlin 1997), but the combination of a leporipoxvirus with another unrelated pox virus has not been known to occur (USDA 1991, p. 42). Rare examples of recombination between different poxviruses in animal hosts have been documented, although the probability of two viruses infecting the same cell at the same time (which is required for recombination to occur) under natural conditions remains very low (Omlin 1997). Recombination of V-RG with viruses other than orthopoxviruses is not likely (Omlin 1997). In formal risk analyses, APHIS concluded that the probability of recombination with other orthopoxviruses would be limited due to the low prevalence of orthopoxviruses in wildlife species in the U.S. (USDA *undated a and undated b*).

Hahn (1992) concluded that vaccines developed by the newer genetic engineering (i.e., recombinant) techniques such as the ones used to make V-RG vaccine are no more hazardous than vaccines created by more conventional methods (e.g., "attenuation" and "fractionation"). He further indicated that, with recombinant technology, the potential for ending up with a dangerous virulent strain is probably less than with the older "hit-or-miss" methods, because the specific genetic material responsible for making a virus virulent can be removed or altered which makes the virus safer.

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for the RABORAL V-RG vaccine to recombine with other viruses to form new viruses that could cause disease in humans or animals would be negligible.

Conclusion: This analysis, which incorporates previous analyses by reference, supports a conclusion that adverse environmental effects from spontaneous recombination of V-RG with other wild viruses would be exceedingly unlikely and negligible. This is further supported by the fact that there have been no observed adverse effects in wildlife and humans both in Europe and North America following a number of years of experimental and field use of the V-RG vaccine.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

This risk would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of the RABORAL V-RG vaccine recombining with other viruses to form new viruses that could cause disease in humans or animals would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

5.7 Potential for Aerially Dropped Baits to Strike and Injure People or Domestic Animals

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

Bait density would average 75 per sq km (194 per sq mile) in eastern states where raccoon rabies is targeted. This density is sparse enough to predict that the chance of a person being struck and harmed by a falling bait is extremely remote. For example, if 100 persons were standing outdoors in a square mile of area in which ORVAC baits were being dropped, and each person occupies about 2 square feet of space at the time that baits were dropped, the chance of being struck would be 1 in 139,000 (200 sq ft total space occupied by persons divided by 27.8 million sq ft per sq mi). The negligible risk of being struck is further supported by the fact that out of more than 43.75 million baits distributed in the U.S. by APHIS-WS between 1995 and 2003, only 9 incidents have been reported in which a person claimed to have been struck by a falling bait (0.00002 percent chance of being struck by a bait or 1 strike per 4.86 million baits dropped) (USDA 2004b). None of the reports since APHIS-WS' ORVAC program inception have resulted in any injury or harm to the individuals involved. Eight of these incidents occurred in Pennsylvania, Texas, Ohio, and Ontario and did not result in any significant injury or harm to the individuals involved (G. Moore, TX Dept. of Health, pers. comm. 2001; R. Hale, OH Dept. of Health, pers. comm. 2001; C. MacInnes, Ontario Ministry of Natural Resources, pers. comm. 2001).

Of the 10.26 million baits that were distributed by APHIS-WS in 2003, 4 incidents were reported in which a person claimed to have been struck by a falling bait (1 strike per 2.56 million baits dropped in 2003). All 4 incidents were reported in Pennsylvania where baiting was conducted in more urbanized areas (1 strike per 427,600 baits disbursed in Pennsylvania). No reports of injury were received during the 2003 APHIS-WS ORVAC program (USDA 2004b). In 2003, no cases were documented involving falling baits striking or injuring domestic animals. In 2003, reports were received regarding baits striking property. The reports involved 3 trucks, 1 car, 1 sunroof, and 3 swimming pools in Pennsylvania; 1 swimming pool in West Virginia; and 1 house in Georgia (reported to the Alabama Health department) (USDA 2004b). The potential for falling baits to strike or injure people or domestic animals continues to be insignificant. Impacts of the program on this issue are expected to remain negligible. The potential for baits to strike people or animals is further mitigated by the fact that bait disbursal crews avoid dropping baits into cities, towns, and other areas with human dwellings, or if humans are observed below. Hand placement or dropping of baits from slower moving helicopters to allow for more precise control over the areas on which the baits are dropped would primarily be used in urban parks or suburban situations, which would further reduce the risk of being struck. Additionally, in areas where backcountry campgrounds are difficult to discern from the air, bait drops would be coordinated to alert campers of the situation or would be conducted when hiking/camping densities are low.

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for aerially dropped baits to strike and injure people or domestic animals would be negligible.

Conclusion: The chance of a person or animal being struck and harmed by a falling bait would be extremely remote. To further mitigate the possibility of striking people or animals, bait drop crews would avoid areas containing human dwellings.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

This risk would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: There would be no risk of aerially dropped baits striking and injuring people or domestic animals since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

5.8 Potential Impacts on Visitor Use/Experience

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

Many people visit NPS lands each year to escape the sounds and sights of everyday life. Others visit these areas to experience nature in its "natural" state or just to experience the serenity that a NPS park can provide. These people are concerned that the ORVAC program may adversely affect a person's outdoor experience when visiting NPS units in the thirteen states listed under the proposed action (see section 1.2).

Impacts of Aerial Distribution of ORVAC Baits

Some people have expressed that overflights of aircraft involved in the distribution of ORVAC baits may adversely impact visitor use and overall park experience. The natural quiet is an important natural resource of the NPS (USDI 1995). The ORVAC program recognizes this concern and attempts to limit a person's exposure to bait distributing aircraft.

Effects on park visitors can be highly variable depending upon the park activities utilized by the visitor (USDI 1995). Backcountry visitors (people using remote areas of the park that are inaccessible by vehicles) would likely be affected to a greater extent than frontcountry visitors (people using areas that are accessible to vehicles).

In general, it appears that the more serious potential impacts occur when overflights are *chronic*, i.e., they occur daily or more often over long periods of time. Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. ORVAC program aerial bait distribution activities are not chronic, but only occur once per year. They are typically conducted during the spring and/or fall months (February 1-May 31 and/or August 15 to November 30); at about 500 feet above ground level; and only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. There is a possibility that a visitor may be exposed to a brief encounter with an aircraft distributing baits but not to the extent that a person would be exposed repeatedly or for an extended period of time.

Due to the limited amount of exposure to bait distributing aircraft, it is highly unlikely that a person's park experience would be seriously impacted by this action.

Impacts of Finding an ORVAC Bait or Vaccine Sachet

People visiting NPS units in the thirteen states listed under the proposed action are concerned that their park experience may be lessened as a result of finding an unconsumed bait or empty sachet. The likelihood of this occurring is extremely low due to the limited number of baits that are dropped in a specific area, the biodegradability of the vaccine liquid and baits, and the high consumption rate of ORVAC baits by animal species.

The possibility of a person coming in contact with an ORVAC bait is extremely low due to the bait distribution densities used by the program. Under the proposed program, ORVAC baits would be distributed once a year at an average density of 75 per square km. Furthermore, McGuill et al. (1998) conducted a retrospective 4-year survey of directors of 6 ORVAC programs using V-RG vaccine from 1992-1996. The programs occurred in Florida (2), Massachusetts (6), New Jersey (6), New York (7), and Texas (2). Altogether, they involved a total of 42,181 sq miles of treated area and a total of nearly 6 million baits distributed. Human contacts with the baits totaled 316.

The baits used for the raccoon ORVAC program are small blocks of fishmeal that are held together with a polymer binding agent and are considered to be "food grade" materials. Therefore, the unconsumed bait material would quickly biodegrade when exposed to the environment.

The ORVAC baits are readily taken up and consumed by wildlife species thereby reducing the possibility of a person coming into contact with an ORVAC bait. The likelihood of a bait being consumed is dependent upon several factors including animal densities (target and nontarget species), bait preference, and the availability of alternative food sources. In field tests conducted in the U.S., the majority of ORVAC baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100 percent of the baits being consumed within a 7 day period (Farry et al. 1998a and 1998b, Hable et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989a, Linhart et al. 1994, Steelman et al. 2000, USDA 1995a).

There is a remote possibility that a park visitor may encounter a sachet since they are not readily digested by animals that consume ORVAC baits. This type of occurrence is expected to be minimal. Out of approximately 43.75 million baits disbursed since APHIS-WS program inception in 1995, only 576 people reported contacting or potentially contacting a bait (i.e., picking up bait, finding a bait in yard, or removing bait or sachet from pet's mouth, feces, or vomit - any type of contact with a bait is also defined throughout the document as an "exposure"). This equates to one human exposure per 75,955 baits distributed (0.0013 percent contact cases). In addition, exposure cases were generally insignificant as most involved finding an intact bait. Very few cases involved touching a broken bait, sachet, or liquid vaccine. Most people were exposed to baits as a result of a pet finding the bait and bringing it home. Therefore, the possibility of a park visitor encountering a bait would likely be even lower on NPS units.

Risk of Being Exposed to a Rabid Animal

Since the first field release of the V-RG vaccine in 1990, the number of vaccine-laden baits that were distributed annually in the U.S. has risen exponentially. For instance, APHIS-WS' involvement in the national rabies management program between 1995 and 2003 contributed to 43.75 million ORVAC baits disbursed in the U.S (USDA 2004c). Numerous projects have been conducted or are in progress in the eastern U.S. and Texas (USDA 2004a, 2004c). Since ORVAC program inception, positive rabies cases have either decreased or the advance of the virus has been slowed or stopped in each state where an ORVAC program was initiated:

- In Maryland, 18 rabies cases were reported per year on the Annapolis Peninsula alone before the ORVAC program began in 1998. From 2000-2002 and 2003, Maryland reported zero cases and one case, respectively (USDA 2004a, 2004c).

- In New York, an ORVAC program was implemented in 1998 to prevent the northward spread of the virus. Prior to the ORVAC program in New York, almost 150 positive rabies cases were recorded in 1998 and 1999. In 2002, New York reported a decline to 4 positive rabies cases, of which only one was attributed to a raccoon, and zero cases have been reported since (USDA 2004a, 2004c). A recently completed project in Albany and Rensselaer Counties of New York State demonstrated that raccoon rabies may be virtually eliminated from an area where the disease had been present for a number of years by use of ORVAC.

  In late August, 2004, APHIS-WS initiated a cooperative emergency rabies surveillance and control program on Long Island (Nassau County) in cooperation with the New York State Department of Health (NYSDOH), Agriculture and Markets, Department of Environmental Conservation and the Nassau County Department of Health. The program included enhanced surveillance to better document the location and scope of a recent rabies outbreak and vaccination of raccoons to prevent the further spread of rabies. As a result of enhanced surveillance efforts, seven raccoons were confirmed to have the raccoon strain of rabies in Nassau County. More than 350 raccoons were trapped and submitted for testing within a 2 mile radius of the index case. This is the first time raccoon rabies has been documented on Long Island. Two types of vaccination programs were implemented in September, 2004 on Long Island by APHIS-WS and NYSDOH, including raccoon trap-vaccinate-release (more than 400 raccoons vaccinated) and ORVAC programs where 11,000 coated sachet baits were distributed by New York State police helicopters and 10,000 fishmeal polymer baits were distributed by hand in a zone around the positive cases. The contingency effort on Long Island focused on creating a rabies-immune raccoon population in the target zone to prevent additional cases. High densities of raccoons on Long Island make it more likely for a human, pet, or other domestic animal to encounter a rabid raccoon; thus the spread of raccoon rabies is of great concern. Enhanced surveillance and vaccination of raccoons will greatly

decrease the chance of human and domestic animal contact with rabid raccoons (R. Chipman, APHIS-WS, pers. comm. 2004).

- In Vermont, before the program was started in 1996, positive rabies cases were found 73 km. (45.5 miles) south of the Quebec, Canada border. With an annual rate of spread of rabies at 56.3 km/year (35 miles/year), positive raccoon strain rabies cases should have reached the Canada border as early as 1999. However, the border has not yet been breached (USDA 2004a, 2004c). Annual vaccination projects in the Lake Champlain Valley in Vermont and New York have shown promise in preventing the northward spread of raccoon rabies. Raccoon rabies has moved through much of the St. Lawrence River Valley in northern New York with the appearance of two raccoon rabies foci (i.e., point locations of rabies cases) in southern Ontario. Cooperative efforts with Ontario and the implementation of point infection control strategies in Ontario around these foci are under evaluation to determine if the raccoon variant of the rabies virus can be contained and eliminated (L. Bigler, pers. comm. 2001).

- In Ohio, 62 positive rabies cases were recorded prior to program implementation in 1997. From 2001-2003, three cases were reported near the Pennsylvania border where raccoon rabies is still enzootic. In 2001, APHIS-WS, in coordination with state agencies, began an ORVAC program in Pennsylvania (USDA 2004a, 2004c) to address this issue. The ability to create rabies-free zones, within raccoon rabies enzootic areas, is a requisite to achieve elimination of this variant of the rabies virus.

  In mid-July 2004, a raccoon infected with raccoon variant of the rabies virus was confirmed just west of the ORVAC zone near Lake Erie in Lake County in northeastern Ohio. This cooperative ORVAC project began in 1997 and has expanded to include the states of Pennsylvania, West Virginia, Virginia, Tennessee, Maryland, Georgia and Alabama. Throughout its length from Ohio to northeastern Alabama, the ORVAC zone is at least 30-miles in width to attempt to prevent the westward spread of raccoon rabies. APHIS-WS and state, county and municipal cooperators responded immediately to this high priority rabies issue. A contingency action plan that included enhanced rabies surveillance, trap-vaccinate-release, and ORVAC was implemented upon detection of the index case. High raccoon population densities and additional rabies cases based on enhanced surveillance suggest that additional action may be required. Enhanced rabies surveillance is being maintained on the south and west sides of this outbreak to determine the next course of action, if required.

- In Massachusetts, the rabies virus had not spread to Cape Cod where intensive baiting programs at the peninsular neck (since 1995), combined with the natural barrier of Cape Cod Canal, seemed to act as effective barriers (Robbins et al. 1998). In early March 2004, however, raccoon variant of the rabies virus was confirmed east of the Cape Cod Canal for the first time. The canal served as the eastern anchor point for the ORVAC zone which was designed to prevent raccoon rabies from spreading east onto the Cape. This cooperative project was initiated in the mid-1990s by Tufts University and the State of Massachusetts Health Department. APHIS-WS became a partner in this effort in 2001. APHIS-WS, Tufts University, and the State of Massachusetts Health Department immediately implemented enhanced rabies surveillance, followed by trap-vaccinate-release, and ORVAC as a contingency action plan to prevent further spread, with the long range goal of eliminating raccoon rabies from the area. It is not known if raccoon rabies spread to the Cape through the long range movement of an individual rabid raccoon, or skunk infected with raccoon variant of the rabies virus, or if the virus spread animal to animal approaching the canal, with rabies spreading to the Cape through a short range raccoon or skunk movement across the canal. Translocation, either intentional or unintentional (i.e., raccoon "hitch-hiking" in a garbage truck or tailored boat and escaping once on the Cape), represents another other potential source of spread.

- In June 2003, the rabies front, which had stalled in North Carolina, finally moved west and crossed over the Appalachians into upper east Tennessee (6 raccoon strain cases were reported). In attempt to stay ahead of the rabies front, APHIS-WS extended the ORVAC baiting area into Tennessee (USDA 2004a, 2004c).

- Since 1995, 9.35 million vaccine-laden baits have been distributed in south Texas in an ORVAC program that has proved to be highly effective in the elimination of the coyote rabies strain in that area. Prior to the ORVAC program, 166 canine strain rabies cases were reported in Texas. One case was reported in 2001 along the Texas-Mexico border and zero cases have been reported since. Similar success is sought in the gray fox

epizootic in west-central Texas where 10.6 million vaccine-laden baits have been distributed. In 2002, 18 positive cases of gray fox strain rabies occurred outside the barrier, possibly due to an interrupted baiting program in 2000 and 2001 as a result of a lack of funding. Increased funding was provided for the 2003 gray fox ORVAC program in Texas in order to encircle the zone where positive cases have been reported and blanket the area (USDA 2004a, 2004c).

These data clearly demonstrate that the ORVAC program has been effective at stopping the forward advance of various rabies strains and in reducing the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans. A similar response to the program can be expected to occur at NPS units in the thirteen states listed under the proposed action (see section 1.2).

Cumulative Impacts: The ORVAC vaccine and bait that would be used has a negligible risk of causing adverse affects to humans. A limited number of baits would be distributed one time per year on an annual basis, thereby limiting the amount of exposure a person may have to an ORVAC bait or bait distributing equipment (i.e., aircraft). Cumulative impacts to humans would likely be beneficial as the proposed ORVAC program would reduce the risk of humans encountering a rabid animal. Any adverse impacts to humans from exposure to the vaccine or baits would be negligible.

Conclusion: The ORVAC program should have no adverse effects on visitor use/experience (i.e., noise from bait distributing aircraft, finding a bait or sachet, and encountering a rabid animal) at NPS units in thirteen eastern states (see section 1.2). Due to the limited amount of exposure to a bait distributing aircraft, it would be highly unlikely that a person's park experience would be seriously impacted by this action. Although there would be a remote possibility that a park visitor may encounter a sachet since they are not readily digested by animals that consume ORVAC baits, the potential would be negligible. The risk of a park visitor being exposed to a rabid animal would be greatly reduced under this alternative.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

Impacts of Aerial Distribution of ORVAC Baits

The potential impacts of aerial distribution of baits would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Impacts of Finding an ORVAC Bait or Vaccine Sachet

The potential impacts of finding an ORVAC bait or sachet would not occur since ORVAC baits would not be distributed on NPS units in thirteen eastern states (see section 1.2).

Risk of Being Exposed to a Rabid Animal

The risk of a park visitor being exposed to a rabid animal would not be reduced under this alternative. This potential risk could adversely impact a person's park experience if the visitor is concerned with being exposed to or coming in contact with a rabid animal.

Cumulative Impacts: Cumulative impacts of the No Action alternative could result in an increase in human exposure to a rabid animal since animals would not receive vaccination by ORVAC bait distribution. This alternative could result in moderate, adverse cumulative impacts to humans. No other cumulative impacts on visitor use/experience, such as impacts of aerial distribution of ORVAC baits or impacts of finding an ORVAC bait or vaccine sachet, would occur since no ORVAC baits would be used.

Conclusion: The potential impacts of aerial distribution of baits and finding an ORVAC bait or sachet would not occur since ORVAC baits would not be distributed on NPS lands. However, the risk of a park visitor being exposed to a rabid animal would not be reduced under this alternative since ORVAC baits would not be distributed on NPS lands. This alternative could result in moderate, adverse cumulative impacts to humans.

5.9 Potential Effects on NPS Wilderness Areas

Alternative 1 - Authorize an ORVAC Program (Proposed Action)

There is concern that the proposed ORVAC program may result in adverse effects on the proposed wilderness area located in the Shenandoah National Park (79,579 acres in VA). Approximately 25 designated Wilderness Areas are also located adjacent to the Appalachian National Scenic Trail. However, 24 of these 25 Wilderness Areas are under USDA-Forest Service jurisdiction and the 25th is the aforementioned Shenandoah National park Wilderness Area. The ORVAC program would not have authority under the provisions of this document to conduct activities on lands other than NPS-managed lands. The proposed program would be conducted in accordance with The Wilderness Act of 1964 (P.L. 88-577). The Act, in part, defines a wilderness area as:

> *"A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural condition"*

The act prohibits and restricts certain uses of these designated lands. The Act provides special provisions to allow certain activities to take place within designated wilderness areas such as the use of aircraft to control fire, insects and diseases (Sec. 4 (d)). The use of aircraft for the purpose of distributing ORVAC baits to prevent or stop the spread of the rabies virus would be conducted under such a special provision.

The only part of the ORVAC program that has potential to effect a wilderness area is the aerial distribution of baits. However, the visual and auditory impacts that an aircraft may have on a designated wilderness are expected to be negligible. ORVAC program aerial bait distribution activities are not chronic, but only occur once per year. They are typically conducted during the spring and/or fall months (February 1-May 31 and/or August 15 to November 30); at about 500 feet above ground level; and only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution. This one time annual event should result in negligible impacts to designated wilderness areas.

Cumulative Impacts: Adverse cumulative impacts of the proposed ORVAC program as a result of the potential for negative effects to NPS wilderness areas would be negligible.

Conclusion: The only part of the ORVAC program that has potential to affect a wilderness area is the aerial distribution of baits. However, the visual and auditory impacts that an aircraft may have on a designated wilderness would be negligible.

Because the actions described in the alternative would not severely affect a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the units; (2) key to the natural or cultural integrity of the units or to opportunities for enjoyment of the units; or (3) identified as a goal in the units' general management plan or other relevant National Park Service planning documents, there would be no impairment of the parks' resources or values.

Alternative 2 - No Action (No Involvement in Rabies Prevention or Control)

The potential effects on wilderness areas would not occur since ORVAC baits would not be distributed in the Shenandoah National Park (VA).

Cumulative Impacts: No cumulative impacts from the distribution of ORVAC into the environment would occur since no ORVAC baits would be used.

Conclusion: The risk of negatively impacting NPS wilderness areas would not occur since ORVAC baits would not be distributed on NPS units in the states listed under the proposed action (see section 1.2).

APPENDIX A
LIST OF PREPARERS, REVIEWERS, PERSONS/AGENCIES CONSULTED, AND EA MAILING LIST

LIST OF PREPARERS/REVIEWERS:

Wendy Servoss, Wildlife Biologist - Environmental Coordinator, USDA, APHIS-WS, Raleigh, NC – *preparer/editor*

Gary A. Littauer, Wildlife Biologist – National Environmental Manager, USDA, APHIS-WS, Albuquerque, NM – *preparer/editor*

Dennis Slate, Wildlife Biologist – National Rabies Program Coordinator, USDA, APHIS-WS, Concord, NH – *preparer/editor*

Richard Chipman, Wildlife Biologist – State Director NY, USDA, APHIS-WS, Castleton, NY – *preparer/editor*

John Forbes, Wildlife Biologist – USDA, APHIS-WS, Morgantown, WV – *editor*

Craig Kostrzewski, Wildlife Biologist – USDA, APHIS-WS, Concord, NH - *editor*

Robert L. Hale, GIS Planner – Rabies Program, USDA, APHIS-WS, Columbus, OH – p*repared maps*

Wayne Millington, Northeast Region NPS, Philadelphia, PA - *preparer/editor*

David Reynolds, Northeast Region NPS, Philadelphia, PA - *preparer/editor*

Donald Owen, Appalachian National Scenic Trail, NPS, GA-ME - *preparer/editor*

Jim Johnson, Eisenhower National Historic Site/Gettysburg National Military Park, NPS, PA - *preparer/editor*

Brian Eick, Appomattox Court House National Historical Park, NPS, VA - *preparer/editor*

Tim Sims, Booker T. Washington National Monument, NPS, VA - *preparer/editor*

Gregg Kneipp, Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park, NPS, VA - *preparer/editor*

Tim Bluminschine, Petersburg National Battlefield, NPS, VA - *preparer/editor*

Cynthia Macleod, Richmond National Battlefield Park, NPS, VA - *preparer/editor*

Rolf Gubler, Shenandoah National Park, NPS, VA - *preparer/editor*

LIST OF PERSONS/AGENCIES CONSULTED:

In addition to the reviewers listed above, the following federal and state agencies and persons were consulted on various aspects of the information and analysis in this EA:

Dr. Charles Rupprecht, Chief, Rabies Section, CDC, Atlanta, GA

Dr. Cathleen Hanlon, CDC, Atlanta, GA

Dr. Laura L. Bigler, Zoonotic Disease Section, College of Veterinary Medicine, Cornell University, Ithaca, NY

Dr. Ernest Oertli, Director, Oral Rabies Vaccination Program, Texas Department of Health, Zoonosis Control Division, Austin, TX

Dr. Kathleen A. Smith, State Public Health Veterinarian, Ohio Department of Health, Columbus, OH

Dr. Roger Krogwold, Assistant State Public Health Veterinarian, Ohio Department of Health, Columbus, OH

Dr. Charles D. MacInnes, Coordinator - Rabies Research, Ontario Ministry of Natural Resources, Wildlife and Natural Heritage Science Section, Peterborough, Ontario

Dr. Donna Gatewood, Chief Staff Veterinarian, Mammalian Virology and Antibody Products, USDA, APHIS - Veterinary Services, Center for Veterinary Biologics, Ames, IA

Dr. John Mitzel, USDA, APHIS - Veterinary Services, Center for Veterinary Biologics, Ames, IA

Dr. Eleanor Eagly, Senior Staff Veterinarian, USDA, APHIS - Veterinary Services, Center for Veterinary Biologics, Ames, IA

Dr. Carolin Schumacher, Merial, Inc., Athens, GA

Guy Moore, Wildlife Biologist, Deputy Director, Oral Rabies Vaccination Program, Texas Department of Health, Zoonosis Control Division, Austin, TX

Dr. Malcolm Smith, Senior Vice President, Bait-Tek, The Woodlands, TX

Dr. Margaret Wild, Wildlife Veterinarian, Biological Resource Management Division, NPS, Ft. Collins, CO

Michael Liddel, Policy Analyst, USDA, APHIS - PPD, Riverdale, MD

Samuel B. Linhart, Research Coordinator (retired), Southeastern Cooperative Wildlife Disease Study, University of Georgia, Athens, GA

Dr. Dale L. Nolte, Research Wildlife Biologist, USDA, APHIS-WS National Wildlife Research Center, Olympia Field Station, Olympia, WA

Douglas Hall, Wildlife Biologist, State Director GA, USDA, APHIS-WS, Athens, GA

Edwin Butler, Wildlife Biologist, State Director ME, USDA, APHIS-WS, Augusta, ME

Libby Roswick, Wildlife Biologist, USDA, APHIS-WS, Augusta, ME

Kevin Sullivan, Wildlife Biologist, State Director, MD, USDA, APHIS-WS, Annapolis, MD

Jeremy Smith, Wildlife Biologist, USDA, APHIS-WS, Annapolis, MD

Monte Chandler, Wildlife Biologist, State Director MA, USDA, APHIS-WS, Amherst, MA

Timothy Algeo, Wildlife Biologist, USDA, APHIS-WS, Amherst, MA

John McConnell, Wildlife Biologist, State Director NH/VT, USDA, APHIS-WS, Concord, NH

Kathleen Nelson, Wildlife Biologist, USDA, APHIS-WS, Berlin, VT

Janet Bucknall, Wildlife Biologist, State Director NJ, USDA, APHIS-WS, Pittstown, NJ

Appendix B
Mark Carrara, Wildlife Biologist, USDA, APHIS-WS, Potsdam, NY

Carl Betsil, Wildlife Biologist, USDA, APHIS-WS, Raleigh, NC

Jason Suckow, Wildlife Biologist, State Director PA, USDA, APHIS-WS, Harrisburg, PA

Brett Dunlap, Wildlife Biologist, State Director TN/KY, USDA, APHIS-WS, Madison, TN

Martin Lowney, Wildlife Biologist, State Director VA, USDA, APHIS-WS, Moseley, VA

Jennifer Cromwell, Wildlife Biologist, Assistant State Director VA, USDA, APHIS-WS, Moseley, VA

William Bonwell, Wildlife Biologist, State Director WV, USDA, APHIS-WS, Elkins, WV

LIST OF EA RECIPIENTS:

Mr. David Foster
American Cave Conserv. Assoc.
P.O. Box 409
Horse Cave, KY 42749

Alison Robbins
Tufts Univ. School of Veterinary Medicine
2200 Westboro Road
North Grafton, MA 01536

Don Lein
Box 7586, Diag. Lab
CVM Cornell University
Uthaa, NY 14852-5786

Ms. Jean Weaver
Office of International Geology
Department of the Interior, USGS
917 National Center
Reston, VA 22092

Mr. Henry Little
The Conservation Fund
1800 North Kent Street, Suite 11
Arlington, VA 22209

Mr. Dave Risley
Administrator, Wildlife Mgmt. & Research
Ohio Division of Wildlife
1840 Belcher Drive
Columbus, OH 43224-1329

Mr. Jim Maddy
National Parks Foundation
1101 17th Street NW
Washington, DC 20036

Dennis Slate
National Rabies Coordinator
USDA-APHIS-WS
59 Chenell Drive, Suite 7
Concord, NH 03301-8548

John Grandy
Humane Society of the US
2100 L Street
Washington, DC 20037

Gary Littauer
National Environmental Manager
USDA-APHIS-WS
8441 Washington NE
Albuquerque, NM 87113

Steven Rowell, DVM
Tufts University
School of Veterinary Medicine
200 Westboro Road
North Grafton, MA 01536

D.J. Schubert
Wildlife Biologist/Ranch Manager
The Fund for Animals –
Black Beauty Ranch
P.O. Box 367
Murchison, TX 75778

Larry Glickman, VMD, DrPH,
Professor of Epidemiology
Department of Veterinary Pathobiology
Purdue University
West Lafayette, IN 47907-1243

Joe Corn
Southeastern Cooperative
Wildlife Disease Study
University of Georgia
Athens, GA 50602

Joanne Maki
Merial Limited
115 Transtech Drive
Athens, GA 30601

Kent D. McClure, DVM, JD,
General Counsel
Animal Health Institute
1325 G. Street, N.W., Suite 700
Washington, DC 20005

Dara Reid, Director
Wildlife in Crisis, Inc.
30 Mountain View Road
Bethany, CT 06524

Yelena Dubrovin
Thomas Jefferson University
Jefferson Medical College
1020 Locust Street, Suite M85 JAH
Philadelphia, PA 19107-6799

Dr. Jane Rissler, Ph.D.,
Senior Staff Scientist
Union of Concerned Scientists
1707 H. Street, N.W., Suite 600
Washington, DC 20006-3919

Amy Bellomy, RN, MPH, PhD (ABD)
Santa Barbara County Health Dept.
345 Camino Del Remedio
Santa Barbara, CA 93110

Manuel Camilo Vargas, DVM, MPH,
Regional Advisor
PAHO/PANAFTOSA
525 23rd Street, NW
Washingon, DC 20037-2847

Jean Hofve, DVM
Companion Animal Program Coordinator
Animal Protection Institute
P.O. Box 22505
Sacramento, CA 95822-0505

American Bird Conservancy
P.O. Box 249
The Plains, VA 20198

Peter Muller
Wildlife Watch, Inc.
P.O. Box 562
New Paltz, NY 12561

Alan Berger
Animal Protection Institute
P.O. Box 22505
Sacramento CA 95822

Camilla Fox
Animal Protection Institute
P.O. Box 22505
Sacramento CA 95822

D.C. Jasper Carlton
Bio-diversity Legal Foundation
198 W. Sicyamore Lane
Louisville, CO 80027

Chuck Wills
Coalition to Protect Canada Geese
5830 Oakwood Drive
Lisle, IL 60532

Robert Ferris
Defenders of Wildlife
1101 14th St., NW, Suite 1400
Washington DC 20005

Caroline Kennedy
Defenders of Wildlife
1130 17th Street, NW
Washington, DC 20005

Brock Evans
Endangered Species Coalition
1101 14th St., NW Suite 1400
Washington DC 20005

Priscilla Feral, President
Friends of Animals
777 Post Road, Suite 205
Darien, Connecticut 06820

D.J. Schubert and Associates
Fund for Animals
P.O. Box 11540
Glendale, AZ 85318-1540

National Audubon Society
700 Broadway, Dept. W
New York, NY 10003

Douglas Inkley
National Wildlife Federation
11100 Wildlife Center Dr.
Reston, VA 20190-5362

John Seidensticker, Ph.D.
National Zoological Park
Smithsonian Institute
Washington, DC 20008

Natural Resources Defense Council, Inc.
40 West 20th Street
New York, NY 10011

Natural Resources Defense Council
Attn: John Adams, Executive Director
1350 New York Ave., NW
Washington DC 20005

Nature Conservancy
4245 N. Fairfax Drive, Suite 100
Arlington, VA 22203-1606

Stephanie Boyles
PETA
501 Front Street
Norfolk, VA 23510

Brooks Fahy
Predator Defense Institute
P.O. Box 5079
Eugene, OR 97405

Tom Skeele
Predator Conservation Alliance
Box 6733
Boseman, MT 59771

The Sierra Club
85 2nd Street, 2nd Floor
San Francisco, CA 94105-3441

Tracy DuVernoy
DHMH Center for the Vet Public Health
201 W. Preston St.
Baltimore, MD 21010

Francois Elvinger
VA-MD Reg. College of Vet Medicine
VA Tech
Blacksburg, VA 24061-0442

Ernest (Skip) Oertli
Texas Dept. of Health
Zoonosis Control Division
1100 W. 49th Street
Austin, TX 78756

Thomas J. DeLiberto,
USDA-APHIS-WS-NWRC
4101 LaPorte Avenue
Fort Collins, CO 80521-2154

Laura Bigler
Cornell University
777 Warren Rd.
Ithaca, NY 14850

Richard Chipman
USDA-APHIS-WS
1930 Route 9
Castleton, NY 12033-9653

Margaret A. Wild, DVM, PhD
National Park Service
Biological Resource Mgt. Division
1201 Oak Ridge Drive, Suite 200
Fort Collins, CO 80525

Director
National Park Service
1849 C St NW
Washington, DC 20240-001

Charles S. Brown
USDA-APHIS-WS
920 Main Campus Drive, Suite 200
Raleigh, NC 27606

Migratory Bird Office
USFWS – Northeast Region
300 Westgate Center Drive
Hadley, MA 01035-9589

Mr. Frank Bowers
Div. Chief/Regional Migratory Bird Coord.
Migratory Bird Office
USFWS – Southeast Region
1875 Century Blvd., Suite 240
Atlanta, GA 30345

Douglas Hall
USDA-APHIS-WS
School of Forest Resources
University of Georgia
Athens, GA 30602-2152

Jon Heisterberg
USDA-APHIS-WS
6213-E Angus Drive
Raleigh, NC 27617

Wilderness Watch
P O Box 9175
Missoula, MT 59807

Brett Dunlap
USDA-APHIS-WS
537 Myatt Drive
Madison, TN 37115

Joanne Garrett
Director
USDA-APHIS-WS-OSS
4700 River Road, Unit 87
Riverdale, MD 20737-1234

Jay Watson, Regional Director
The Wilderness Society
Presidio Bldg. 1016
San Francisco, CA 94129

Sinapu
4990 Pearl East Circle, Suite 301
Boulder, CO 80301

Catfish Farmers of America
1100 Hwy 82 East
Suite 202
Indianola, MS 38751

National Aquaculture Association
111 W. Washington Street
Suite 1
Charles Town, WV 25414-1529

Sharon T. Brown
Beavers, Wetlands, and Wildlife
146 Van Dyke Road
Dolgeville, NY 13329

Edwin Butler
USDA-APHIS-WS
Capital West Business Center
81 Leighton Road, Suite 12
Augusta, ME 04330

Kevin Sullivan
USDA-APHIS-WS
1568 Whitehall Road
Annapolis, MD 21401

Appendix B

Monte Chandler
USDA-APHIS-WS
463 West Street
Amherst, MA 01002

John McConnell
USDA-APHIS-WS
59 Chenell Drive, Suite 7
Concord, NH 03301-8548

Janet Bucknall
USDA-APHIS-WS
140-C Locust Grove Rd
Pittstown, NJ 08867-4049

Allegheny County Health Department
Joan McMahon
3441 Forbes Avenue
Pittsburgh, PA 15213

Jason Suckow
USDA-APHIS-WS
P.O. Box 459
Summerdale, PA 17093-0459

Martin Lowney
USDA-APHIS-WS
P.O. Box 130
Moseley, VA 23120

William Bonwell
USDA-APHIS-WS
730 Yokum Street
Elkins, WV 26241

Erie County Department of Health
Joe Trzybinski
606 West Second St.
Erie, PA 16507

PA Department of Agriculture
Dr. John Enck
2301 North Cameron Street
Harrisburg, PA 17110

Richard Curnow
USDA-APHIS-WS
National Wildlife Research Center
4101 LaPorte Avenue
Fort Collins, CO 80521-2154

Charles Rupprecht
CDC
1600 Clifton Road
Atlanta, GA 30337

PA Department of Health
Marshall Deasy
PO Box 90
Harrisburg, PA 17108

Marie Rust (or Dave Reynolds)
National Park Service
Northeast Region
U.S. Custom House
200 Chestnut St., Fifth Floor
Philadelphia, PA 19106

Terry Calstrom (or Dan Sealy)
National Park Service
National Capital Region
1100 Ohio Dr., SW
Washington D.C. 20242

William Schenk (or Chris Furqueron)
National Park Service
Southeast Region
100 Alabama St. SW
1924 Building
Atlanta, GA 30303

Dr. Ron Wilson
State Veterinarian
Tennessee Dept. of Agriculture
Ellington Agricultural Center
P.O. Box 40627
Nashville, TN 37204

Silvia Kreindel DVM, MPH
Veterinary Epidemiologist
MA Department of Agricultural Resources
MA Bureau of Animal Health
251 Causeway Street Suit 500
Boston, MA 02114

MD Dept. Health and Mental Hygiene
Karon Damewood R.N.
Chief, Division of Rabies and Vector-Borne Disease
201 West Preston St, 3rd Floor
Baltimore, MD 21201

Shelley Doak, Director
Division of Animal Health and Industry
DOA
AMHI Complex- Deering Building,
SHS 28
Augusta, ME 04333

Sam Hamilton, Regional Director
U.S. Fish and Wildlife Service
Region 4 – Southeast
Century Center
1875 Century Blvd.
Atlanta, GA 30345

Dr. Mamie Parker, Regional Director
U.S. Fish and Wildlife Service
Region 5 – Northeast
300 Westgate Center Dr.
Hadley, MA 01035-9589

State Clearinghouse
1301 Mail Service Center
Raleigh, NC 27699-1301

Dr. Philip Hanes, Deputy Director
Department of Human Services, SHS 11
Augusta, ME 04333

Sandra Tucker, Field Supervisor
USFWS-Ecological Services
247 South Milledge Ave.
Athens, GA 30605-1045

Tom Decker, Director, Wildlife Division
Vermont Fish and Wildlife Department
Agency of Natural Resources
103 South Main St., 10 South
Waterbury, VT 05671-0501

Gordon Russell, Field Supervisor
USFWS-Ecological Services
1168 Main St.
Old Town, ME 04468-2023

Brian Cole, Field Supervisor
USFWS-Ecological Services
160 Zillicoa St.
Asheville, NC 28801

Mike Bartlett, Field Supervisor
USFWS
Ecological Services-New England
70 Commercial St., Suite 300
Concord, NH 03301-5087

John Staples, Field Supervisor
USFWS-Ecological Services
927 North Main St., Building D
Pleasantville, NJ 08232-1454

David Spilwell, Field Supervisor
USFWS-Ecological Services
3817 Luker Rd.
Cortland, NY 13045-9349

Ed Warr
Asst. Chief of Wildlife
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
P.O. Box 40747
Nashville, TN 37204

David Densmore, Field Supervisor
USFWS-Ecological Services
315 South Allen St., Suite 322
State College, PA 16801-4850

Dr. Lee Barclay, Field Supervisor
USFWS-Ecological Services
446 Neal St.
Cookeville, TN 38501-4027

Karen Mayne, Field Supervisor
USFWS-Ecological Services
6669 Short Lane
Gloucester, VA 23061-4410

Thomas R. Chapman, Field Supervisor
USFWS-Ecological Services
694 Beverly Pike
Elkins, WV 26241-9475

Field Supervisor
USFWS-Ecological Services
177 Admiral Cockrane Dr.
Annapolis, MD 21401-7307

Robert Ellis
Assistant Director, Wildlife Division
VA Dept. of Game and Inland Fisheries
P.O. Box 11104
Richmond, VA 23230-1104

Mark Stadler,
Wildlife Division Dir.
DIFW
284 State Street, SHS 41
Augusta, ME 04333

Paul A. Peditto
MD Dept. of Natural Resources
Wildlife and Heritage Division
580 Taylor Avenue, E-1
Annapolis, MD 21401

Carl Cushing, Director
Food Safety and Consumer Affairs
VT Agency of Ag, Food & Markets
116 State Street, Drawer 20
Montpelier, VT 05620

Dr. Bob Johnson
State Public Health Veterinarian
VT Dept. of Health
Epidemiology and Disease Prevention
108 Cherry St., P.O. Box 70
Burlington, VT 05402

Paucatuck Eastern Pequot
935 Lantern Hill Rd.
Ledyard, CT 06339

Schaghticoke Indian Tribe
626 Washington Rd.
Woodbury, CT 06798

The Georgia Tribe of Eastern Cherokee
P.O. Box 1915
Cumming, GA 30028

The Cherokee of Georgia
Saint George, GA 31646

The Lower Muscogee Creek Tribe
Route 2, Box 370
Whigham, GA 31797

Fredric Cantor, DVM, MPH
Commonwealth of Massachusetts
Dept. of Public Health
Bureau of Communicable Disease Control
State Laboratory Institute
305 South Street
Jamaica Plain, MA 02130-3597

Hassanamisco Nipmuc
Hassanamisco Reservation
Grafton, MA 01519

Nanticoke Lenni-Lenape
P.O. Box 544/18 E. Commerce St.
Bridgeton, NJ 08302

Pwhatan Renape Nation
Rankokus Indian Reservation
P.O. Box 225
Rancocas, NJ 08073-0225

Shinnecock Tribe
Rte. 27-A, Montauk Highway
Southampton, NY 11968

Unkechaug Indian Nation of Poospatuck Indians
P.O. Box 86
Mastic, Long Island, NY 11950

Coharie Intra-Tribal Council
Rt. 3, Box 340-E
Clinton, NC 28328

Haliway-Saponi Tribe, Inc.
P.O. Box 99
Hollister, NC 27844

Lumbee Regional Development
P.O. Box 68
Pembroke, NC 28372

Meherrin Indian Tribe
P.O. Box 508
Winton, NC 27986

Chrissie Henner
Commonwealth of Massachusetts
Division of Fisheries and Wildlife
Field Headquarters
1 Rabbit Hill Road
Westborough, MA 01581

Chickahominy Tribe
RFD 1, P.O. Box 325
Providence Forge, VA 23140

Eastern Chickahominy
Rt. 2, Box 90
Providence Forge, VA 23140

Mattiponi Indian Nation
Route 2, P.O. Box 325
West Point, VA 23181

Monacan Indian Tribe
P.O. Box 173
Monroe, VA 27574

Nansemond Indian Tribal Assoc.
3429 Galberry Road
Chesapeake, VA 23323

Pamunkey Nation
Rt. 1, P.O. Box 226
King William, VA 23086

Rappahannock Tribe
Indian Neck VA 23077

Upper Mataponi Tribe
106 Kyle Circle
Tabb, VA 23602

Native American Indian Federation
P.O. Box 2903
Huntington, WV 25728-2903

James W. Ransom, Chief
Saint Regis Mohawk Tribe
412 State Route 37
Akwesasne, NY 13655

William Phillips, President
Aroostook Band of Micmacs
P.O. box 772
Presque Isle, ME 04769

Vernon Isaac, Chief
Cayuga Nation of Nations
P.O. Box 11
Versailles, NY 14168

Leon D. Jones, Principal
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, NC 28719

Brenda Commander, Chairperson
Houlton Band of Maliseet Indians
88 Bell Road
Littleton, ME 04730

Kenneth M. Reels, Chairperson
Mashantucket Pequot Tribal Nation
P.O. Box 3060
Mashantucket, CT 06339

Mr. Michael Cahill
Rabies Program Coordinator
MA Dept. of Agricultural Resources
Bureau of Animal Health
251 Causeway Street, Suite 500
Boston, MA 02114-2151

Mark Brown, Chairperson
Mohegan Indian Tribe
P.O. Box 488
Uncasville, CT 06382

Ray Halbritter, Representative
Oneida Indian Nation
223 Genessee St.
Ames Plaza
Oneida, NY 13421

Irving Powless, Jr., Chief
Onondaga Indian Nation
RR 1, Box 319-B
Nedrow, NY 13120

Richard Stevens, Governor
Passamaquoddy Tribe
Indian Township Reservation
P.O. Box 301
Princeton, ME 04668

Melvin Francis, Governor
Passamaquoddy Tribe
Pleasant Point Reservation
P.O. Box 343
Perry, ME 04667

Barry Dana, Tribal Governor
Penobscot Indian Nation
6 River Road
Indian Island, ME 04468

Dr. Paul Erwin
Regional Director
East TN Regional Office
1522 Cherokee Trail
P.O. Box 59019
Knoxville, TN 37950-9019

Dr. Gary Swinger
Tennessee Dept. of Health
4th Floor, Cordell Hull Bldg.
Nashville, TN 37247-4911

Cyrus Schindler, President
Seneca Nation of Indians
1490-Rte. 438
Irving, NY 14081

Richard Velkey, Chief
Schaghticoke Tribal Nation
33 Elizabeth St. 4th Floor
Derby, CT 06418

Emerson Webster, Chief
Tonawanda Band of Seneca
7027 Meadville Rd.
Basom, NY 14013

Leo R. Henry, Clerk, Chief
Tuscarora Nation
2006 Mt. Hope Rd.
Lewiston, NY 14092

Beverly Wright, Chairperson
Wampanoag Tribe of Gay Head
20 Black Brook Rd.
Aquinnah, MA 02535

Dr. Lori Sheeler
Tennessee Dept. of Health
East TN Regional Office
1522 Cherokee Trail
P.O. Box 59019
Knoxville, TN 37950-9019

Betsy L. Child, SHPO
Herbert Harper, Deputy
State of Tennessee-Department of
Environment and Conservation
401 Church St.
Nashville, TN 37243-0435

Lonice C. Barrett, SHPO
Dr. W. Ray Luce, Deputy
GA Dept. of Natural Resources
Historic Preservation Division
156 Trinity Ave. SW, Suite 101
Atlanta, GA 30303-3600

Larry Marcum
Chief of Wildlife
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
P.O. Box 40747
Nashville, TN 37204

Dr. Jeffrey Crow, SHPO
David Brook, Deputy
Division of Archives and History
4610 Mail Service Center
Raleigh, NC 27699-4610

Nancy Herholdt, SHPO
Susan Pierce, Deputy
WV Division of Culture and History
State Historic Preservation Office
1900 Kanawha Blvd. East
Charleston, WV 25305

PA Game Commission
Bureau of Wildlife Management
Robert Boyd
2001 Elmerton Ave
Harrisburg, PA 17110

Dr. Jill Johnson
Tennessee Dept. of Agriculture
Ellington Agricultural Center
P.O. Box 40627
Nashville, TN 37204

Earle Shettleworth, Jr., SHPO
Kirk Mohney, Deputy
Maine Historic Preservation Commission
55 Capitol St., Station 65
Augusta, ME 04333

Rodney Little, SHPO
Elizabeth Hughes, Deputy
Maryland Historical Trust
100 Community Place, Third Floor
Crownsville, MD 21032-2023

Cara Metz, SHPO
Brona Simon, Deputy
Massachusetts Historical Commission
220 Morrissey Blvd.
Boston, MA 02125

James McConaha, Director/SHPO
Linda Ray Wilson, Deputy
NH Division of Historical Resources
P.O. Box 2043
Concord, NH 03302-2043

Bradley M. Campbell, SHPO
Dorothy Guzzo, Deputy
Dept of Environ Protection
401 East State Street
PO Box 402
Trenton, NJ 08625

Bernadette Castro, SHPO
Ruth Pierpont, Director
Parks, Recreation & Historic Preservation
Agency Blg.#1, Empire State Plaza
Albany, NY 12238

PA Game Commission
Bureau of Law Enforcement
Tim Grenoble
2001 Elmerton Ave
Harrisburg, PA 17110

Barbara Franco, SHPO
Jean Cutler, Deputy
PA Historical & Museum Commission
300 North Street
Harrisburg, PA 17120

Jane Lendway, Interim SHPO
Eric Gilbertson, Deputy
VT Division for Historic Preservation
National Life Building, Drawer 20
Montpelier, VT 05620-0501

Kathleen Kilpatrick, SHPO
Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

Mark Ellingwood
Wildlife Programs Administrator
NH Fish and Game Department
11 Hazen Drive
Concord, NH 03301

Dr. Clifford W. McGinnis
State Veterinarian
NH Dept. of Ag., Markets and Food
P.O. Box 2042
Concord, NH 03302-2042

Dr. Jose Montero
Chief of Disease Control
NH Dept. of Health and Human Services
29 Hazen Drive
Concord, NH 0330

Curtis Taylor, Chief
West Virginia Division of Natural Resources
Capitol Complex
Building 3, Room 812
Charleston, WV 25305-0664

Gus R. Douglass, Commissioner
West Virginia Department of Agriculture
1900 Kanawha Boulevard, East
Charleston, WV 25305-017

Paul Nusbaum, Secretary
West Virginia Department of Health and Human Resources
Capital Complex
Building 3, Room 206
Charleston, WV 25305

Millie Eidson
NY State Dept. of Health
Bureau of Commun. Disease Control
Zoonosis Program
Corning Tower Bldg ,Empire State Plaza
Albany, NY 12237-0627

John Major/Gordon Batchller
New York Department of Environmental Conservation
NYSDEC Bureau of Wildlife
625 Broadway
Albany, NY 12233-4754

Dr. Jeff Huse/Dr. John Huntley
New York State Agriculture and Markets
Division of Animal Husbandry
One Winners Circle
Albany, NY 12235

Martin J. McHugh, Director
New Jersey Division of Fish and Wildlife
501 East State Street, 3rd Floor
P.O. Box 400
Trenton, NJ 08625-0400

Charles M. Kuperus, Secretary of Agriculture
New Jersey Department of Agriculture
Health and Agriculture Building
Market and South Warren Streets
P.O. Box 330
Trenton, NJ 08625

Dr. Faye Sorhage, State Veterinarian
NJ Dept. of Health and Senior Services
Health and Agriculture Building
Market and South Warren Streets
John Fitch Plaza, 8th Floor, P.O. Box 360
Trenton, NJ 08625-0369

Mr. Noel Holcomb,Director
Wildlife Resources Division
2070 US Hwy.278, SE
Social Circle, GA 30025

Dr. Lee Myers, State Veterinarian
Animal Industry Division
19 Martin Luther King Jr., Dr. SW
Atlanta, GA 30334-4201

Dr. Kathleen Toomey, Director
GA Dept. Human Resources
Division of Public Health
2 Peachtree St. Suite 15-40
Atlanta, GA 30303-3142

Suzanne R. Jenkins, VMD, MPH,
Director, Division of Zoonotic and Enviro. Epidemiology
Virginia Department of Health
James Madison Building (Room 522), 109 Governor St.
Richmond, VA 23219

Robert Duncan
Director, Wildlife Division
VA Department of Game and Inland Fisheries
P.O. Box 11104
Richmond, VA 23230-1104

Wayne Millington, Entomologist
National Park Service-NE Region
209B Ferguson Building
University Park, PA 16302-4301

Michele Batcheller, Wildlife Biologist
National Park Service – NE Region
209B Ferguson Building
University Park, PA 16302-4301

Harold Johnson
2913 Palo Alto
Carlsbad, NM 88220

Center for Biological Diversity
P.O. Box 710
Tucson, AZ 85702-0710

Allison Slater c/o Ecology Center
101 East Broadway
Suite 601
Missoula, MT 59801

Center for Native Ecosystems
1536 Wynkoop, Suite 301
Denver, CO 80202

The Wilderness Society
1615 M St., NW
Washington, DC 20036

APPENDIX B
LITERATURE CITED

Andersen, D.E., O.J. Rongstad, and W.R. Mytton. 1989. Response of nesting red-tailed hawks to helicopter overflights. Condor 91:296-299.

Artois, M., F. Cliquet, J. Barrat, and C.L. Schumacher. 1997. Effectiveness of SAG1 oral vaccine for the long-term protection of red foxes (*Vulpes vulpes*) against rabies. Vet. Rec. 140:57-59.

Artois, M., E. Masson, J. Barrat, and M.F.A. Aubert. 1993. Efficacy of three oral rabies vaccine-baits in the red fox: a comparison. Vet. Microb. 38:167-172.

Baer G.M. 1988. Oral rabies vaccination: an overview. Rev. Infect. Dis. 10:S644-8.

Bailey, R.G. 1995. Description of the ecoregions of the United States. (1st ed. 1980). Misc. Publ. No. 1391 (rev.) Washington, DC: USDA Forest Service. 108 pp.

Beck, A.M. 1984. An epizootic of rabies. Natural History. 93(7):6-10.

Belanger, L. and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. J. Wildl. Manage. 54:36-41.

Belanger, L. and J. Bedard. 1989. Responses of staging greater snow geese to human disturbance. J. Wildl. Manage. 53:713-719.

Brown, C.L. and C.E. Rupprecht. 1990. Vaccination of free-ranging Pennsylvania raccoons (*Procyon lotor*) with inactivated rabies vaccine. J. Wildl. Dis.; 26(2):253-257. 1990.

CDC (Centers for Disease Control and Prevention). 2001a. Rabies prevention and control. Information obtained at web site: http://www.cdc.gov/ncidod/dvrd/rabies

CDC (Centers for Disease Control and Prevention). 2001b. Mass Treatment of humans who drank unpasteurized milk from rabid cows - Massachusetts, 1996-1998. CDC - Morbidity and Mortality Weekly Report. Information obtained from web site: http://www.cdc.gov/ncidod/dvrd/rabies/Professional/MMWRtext/mmwr4811.htm

CDC (Centers for Disease Control and Prevention). 2000. Compendium of animal rabies prevention and control, 2000 - National Association of State Public Health Veterinarians, Inc. CDC - Morbidity and Mortality Weekly Report Vol. 49, No. RR-8. p. 21-30. Information obtained from web site: http://www.cdc.gov/ncidod/dvrd/rabies/

Childs, J.E., Curns, A.T., Dey, M.E., Real, L.A., Feinstein, L., Bjornstad, O.N., and Krebs, J.W. 2000. Predicting the local dynamics of epizootic rabies among raccoons in the United States. Proceedings of the National Academy of Sciences of the USA. 97(25):13666-13671.

Clark, K.A. and P.J. Wilson. 1995. Canine and gray fox rabies epizootics in Texas. Great Plains Wildl. Damage Workshop 12:83-87.

Clark, W.R. and E.K. Fritzell. 1992. A review of population dynamics of furbearers. In: McCullough, D.R., R.H. Barrett, Eds. Wildlife 2001: populations. London, England: Elsevier: 899-910.

Connolly, G. E., and W. M. Longhurst. 1975. The effects of control on coyote populations. Div. of Agric. Sci., Univ. of California Davis. Bull. 1872. 37pp.

Damaso, C.R., J.J. Esposito, R.C. Condit, and N. Moussatche. 2000. An emergent poxvirus from humans and cattle in Rio de Janeiro State: Cantagalo virus may derive from Brazilian smallpox vaccine. Virology 277(2):439-49.

Davidson, W.R., V.F. Nettles, L.E. Hayes, E.W. Howerth, and C.D. Couvillion. 1992. Diseases diagnosed in gray foxes (*Urocyon cinereoargenteus*) from the southeastern United States. Journal of Wildlife Diseases. 28(1):28-33.

Debbie, J.G. 1991. Rabies control of terrestrial wildlife by population reduction. Pages 477-484 in, ed. G.M. Baer, The natural history of rabies. CRC Press, Boston, MA.

Ellis, D.H. 1981. Responses of raptorial birds to low-level jet aircraft and sonic booms. Results of the 1980-81 joint U.S. Air Force-U.S. Fish and Wildl. Service Study. Institute for Raptor Studies, Oracle, AZ. 59 pp.

Elvinger, F. 2001. Oral rabies vaccine safety. Online fact sheet - Fairfax County, VA Oral Rabies Project, available at http://www.fairfax.va.us/SERVICE/HD/vaccsafe.htm

Evans, R.H. 1982. Canine distemper: Diagnosis and treatment. In Wildlife Rehabilitation. Vol. 1. Exposition Press, Smithtown, New York. Pp. 127-137.

Farry, S.C., S.E. Henke, A.M. Anderson, and G.M. Fearneyhough. 1998a. Responses of captive and free-ranging coyotes to simulated oral rabies vaccine baits. J. Wildl. Dis.; 34(1): 13-22.

Farry, S.C., S.E. Henke, S.L. Beasom, and G.M. Fearneyhough. 1998b. Efficacy of bait distributional strategies to deliver canine rabies vaccines to coyotes in southern Texas. J. Wildl. Dis.; 34(1): 23-32.

Flamand, A., P. Coulon, F. Laray, and C. Tuffereau. 1993. Avirulent mutants of rabies virus and their use as live vaccine. Trends in Microbiology 1(8):317-320.

Fraser, J.D., L.D. Frenzel and J.E. Mathisen. 1985. The impact of human activities on breeding bald eagles in north-central Minnesota. J. Wildl. Manage. 49:585-592.

Glueck, T.F., W.R. Clark, and R.D. Andrews. 1988. Raccoon movement and habitat use during the furharvest season. Wildl. Soc. Bull. 16:6-11.

Grubb, T.G. and R.M. King. 1991. Assessing human disturbance of breeding bald eagles with classification tree models. J. Wildl. Manage. 55:500-511.

Grubb, T.G. and W.W. Bowerman. 1997. Variations in breeding bald eagle responses to jets, light planes and helicopters. J. Raptor Res. 31(3):213-222

Grubb, T.G., W.W. Bowerman, J.P. Giesy and G.A. Dawson. 1992. Responses of breeding bald eagles to human activities in northcentral Michigan. Can. Field-Nat. 106:443-453.

Guerra, M.A., Curns, A.T., Rupprecht, C.E., Hanlon, C.E., Krebs, J.W., and Chiles, J.E. 2003. Skunk and raccoon rabies in the eastern United States: temporal and spatial analysis. Emerging Infectious Diseases. 9(9):1143-1151.

Hable, C.P., A N. Hamir, D. E. Snyder, R. Joyner, J. French, V. Nettles, C. Hanlon, and C. E. Rupprecht. 1992. Prerequisites for oral immunization of free-ranging raccoons (*Procyon lotor*) with a recombinant rabies virus vaccine: Study site ecology and bait system development. J. Wildl. Dis.; 28(1): 64-79.

Hadidian, J., S.R. Jenkins, D.H. Johnston, P.J. Savarie, V.F. Nettles, D. Manski, and G.M. Baer. 1989. Acceptance of simulated oral rabies vaccine baits by urban raccoons. J. Wildl. Dis. 25(1):1-9.

Hahn, E.C. 1992. Safety of Recombinant Vaccines *in* Isaacson, R.E. ed. Recombinant DNA Vaccines:

Rationale and Strategy. New York: Dekker. p. 387-400.

Hanlon, C.A., J.E. Childs, V.F. Nettles. 1999. Rabies in wildlife - Article III, Special Series - Recommendations of a national working group on prevention and control of rabies in the United States. J. Amer. Vet. Med. Assoc. 215(11):1612-1620.

Hanlon, C.A., M. Niezgoda, A.N. Hamir, C. Schumacher, H. Koprowski, and C.E. Rupprecht. 1998. First North American field release of a vaccinia-rabies glycoprotein recombinant virus. J Wildl Dis. 34:228-39.

Hanlon, C.A., M. Niezgoda, V. Shankar, H.S. Niu, H. Koprowski, and C.E. Rupprecht. 1997. A recombinant vaccinia-rabies virus in the immunocompromised host: Oral innocuity, progressive parenteral infection, and therapeutics. Vaccine. 1997 Feb;15(2):140-8.

Hanlon, C.A. and C.E. Rupprecht. 1997. Considerations for immunocontraception among free-ranging carnivores: The rabies paradigm. Contraception in Wildlife Management. USDA Technical Bulletin No. 1853, U.S. Department of Agriculture, Washington, D.C. pp 185-194.

Hanlon, C.L., D.E. Hayes, A.N. Hamir, D.E. Snyder, S. Jenkins, C.P. Hable,and C.E. Rupprecht. 1989a. Proposed field evaluation of a rabies recombinant vaccine for raccoons (*Procyon lotor*): Site selection, target species characteristics, and placebo baiting trials. J. Wildl. Dis. 25(4): 555-567.

Hanlon, C.A., E.L. Ziemer, A.N. Hamir, and C.E. Rupprecht. 1989b. Cerebrospinal fluid analysis of rabid and vaccinia-rabies glycoprotein recombinant, orally-immunized raccoons. Am. J. Vet. Res. 50:363-367.

Hasbrouck, J.J., W.R. Clark, and R.D. Andrews. 1992. Factors associated with raccoon mortality in Iowa. J. Wildl. Manage. 56(4):693-699.

Herman, Y.F. 1964. Isolation and characterization of a naturally occurring poxvirus of raccoons. Bacteriol. Proc. 64th Ann. Mtg. Amer. Soc. Microbiol. p. 117.

Hoff, G.L., S.J. Proctor, and L. P. Stallings. 1974. Epizootic of canine distemper virus infection amoung urban raccoons and gray foxes. Journal of Wildlife Diseases. 10:423-428.

Huntley, J., S. Oser, A. Kurst, and L. Karackoloff. (*unpublished*). 1996. The impact of the wildlife rabies epizootic on public health in new york state: A cost benefit analysis of primary vs. secondary intervention strategies. New York State Department of Agriculture and Markets, Division of Animal Industry, 1 Winners Circle, Albany, NY 12235.

Johnston, D.H., D.G. Joachim, P. Bachmann, K.V. Kardong, R.E. Stewart, L.M. Dix, M.A. Strickland, and I.D. Watt. 1987. Aging furbearers using tooth structure and biomarkers *In* M. Novak, J.A. Baker, M.E. Obbard and B. Malloch (Eds.); Wild Furbearers Management and Conservation in North America, Ontario Ministry of Natural Resources, Toronto. pp 228-45.

Kemere, P., M.K. Liddel, P. Evangelou, D. Slate, and S. Osmek. 2001. Economic analysis of a large scale oral vaccination program to control raccoon rabies. Proc. Human conflicts with wildlife: economic considerations symposium. Fort Collins, CO.

Krebs, J.W., H.R. Noll, C.E. Rupprecht, J.E. Childs. 2002. Rabies surveillance in the United States during 2001. JAVMA. 221(12):1690-1701.

Krebs, J.W., C.E. Rupprecht, and J.E. Childs. 2000. Rabies surveillance in the United States during 1999. J. Amer. Vet. Med. Assoc. 217:1799-1811.

Krebs, J.W., J.S. Smith, C.E. Rupprecht, and J.E. Childs. 1999. Rabies surveillance in the United States during 1998. J. Amer. Vet. Med. Assoc. 215:1786-1798.

Krebs, J.W., J.S. Smith, C.E. Rupprecht, and J.E. Childs. 1998. Rabies surveillance in the United States during 1997. J. Amer. Vet. Med. Assoc. 213:1713-1672.

Kushlan, J.A. 1979. Effects of helicopter censuses on wading bird colonies. J. Wildl. Manage. 43:756-760.

Lawson, K.F., D.H. Johnston, J.M. Patterson, R. Hertler, J.B. Campbell, and A.J. Rhodes. 1989. Immunization of foxes by the intestinal route using an inactivated rabies vaccine. Can. J. Vet. Res. 53:56-61.

Lawson, K.F. , H. Chiu, S.J. Crosgrey, M. Matson, G.A. Casey, and J.B. Campbell. 1997. Duration of immunity in foxes vaccinated orally with ERA vaccine in a bait. Can. J. Vet. Res. 61:39-42.

Linhart, S.B., J.C. Wodlowski, D.M. Kavenaugh, L. Motes-Kreimeyer, A.J. Montoney, R.B. Chipman, D. Slate, L.L. Bigler, and M.G. Fearneyhough. *unpublished* 2001. A new flavor-coated sachet bait for delivering oral rabies vaccine to raccoons and coyotes. Manuscript submitted to J. Wildl. Dis. 02/28/01. 35 pp.

Linhart, S.B., F.S. Blom, R.M. Engeman, H.L. Hill, T. Hon, D.I. Hall, and J.H. Shaddock. 1994. A field evaluation of baits for delivering oral rabies vaccines to raccoons (*Procyon lotor*). J. Wildl. Dis. 30(2):185-194.

Linhart, S.B., F. S. Blom, G.J. Jasch, J.D. Roberts, R.M. Engeman, J.J. Esposito, J.H Shaddock, and G.M. Baer. 1991. Formulation and evaluation of baits for oral rabies vaccination of raccoons (*Procyon lotor*). J. Wildl. Dis. 27(1).21-33.

MacInnes, C.D., and LeBer, C.A. 2000. Wildlife management agencies should participate in rabies control. Wildlife Society Bulletin. 28(4):1156-1167.

MacInnes, C. D. 1998. Rabies, *in* M. Novak, J.A. Baker, M.E. Obbard, B. Mallock, eds, Wild Furbearer management and Conservation in North America. Ontario Trappers Association/Ontario Ministry of Natural Resources, Toronto, Ontario, Canada, pp. 910-929.

Mahnel, H. 1987. Experimental results on the stability of poxviruses under laboratory and environmental conditions (*in German*). J. Vet. Med. Ser. B 34 (6); 449-464.

McGuill, M.W., S.M Kreindel, A. DeMaria, Jr., A.H. Robbins., S. Rowell, C.A. Hanlon, C.E. Rupprecht. 1998. Human contact with bait containing vaccine for control of rabies in wildlife. J. Am. Vet. Med. Assoc.; 213(10):1413-1417.

Meltzer, M.I. 1996. Assessing the costs and benefits of an oral vaccine for raccoon rabies: a possible model. Emerging Infectious Diseases 2(4):343-349.

Milius, S. 1998. No raccoon boom after vaccination program. Science News. 153(18): 277.

Mosillo, M., J.E. Heske, and J.D. Thompson. 1999. Survival and movements of translocated raccoons in northcentral Illinois. J. Wildl. Manage.; 63(1): 278-286.

Nettles, V.F., J.H. Shaddock, R.K. Sikes, and C.R. Reyes. 1979. Rabies in translocated raccoons. American Journal of Public Health. 69(6): 601-602.

Noah, D.L., M.G. Smith, J.C. Gotthardt., J.W. Krebs, D.Green, and J.E. Childs. 1995. Mass human exposure to rabies in New Hampshire: Exposures, Treatment, and cost. Public Health Briefs,

National Center for Infectious Diseases, 1600 clifton Rd. Mailstop G-13, Atlanta, GA 30333. 3 pp.

Nolte, D.L., J.R. Mason, G. Eple, E. Aronov, and D.L. Campbell. 1994. Why are predator urines aversive to prey? J. Chem. Ecol. 20(7):1505-1516.

Oertli, E.H., G.M. Moore, B. Hicks, and P. Wilson. 2002. The Texas Oral Rabies Vaccination Program 1995-2002. Texas Department of Health, Zoonosis Control Division. Paper obtained at http://www.tdh.state.tx.us/zoonosis/ORVACp/information/

Omlin, D. 1997. Tools for safety assessment – vaccinia-derived recombinant rabies vaccine. BATS (Biosicherhelsforschung und Abschatzung von Technikfolgen des Schwerpunktprogrammes Biotechnologie). Swiss National Science Foundation. Paper obtained at web site: http://www.bats.ch/abstr/

Pastoret, P.-P., B. Brochier, J. Blancou, M. Artois, M. Aubert, M.-P. Kieny, J.-P. Lecocq, B. Languet, G. Chappuis, and P. Desmettre. 1992. Development and deliberate release of a vaccinia rabies recombinant virus for the oral vaccination of foxes against rabies. In: Binns, M.M.; Smith, G. L., eds. Recombinant Poxviruses. Boca Raton: CRC Press; p. 163-206.

Pastoret, P.P., B. Brochier, and D. Boulanger. 1995. Target and non-target effects of a recombinant vaccinia-rabies virus developed for fox vaccination against rabies. Dev. Biol. Stand. Basel, Karger, vol. 84, pp 183-193.

Prange, S., Gehrt, S.D., and Wiggers, E.P. 2003. Demographic factors contributing to high raccoon densities in urban landscapes. Journal of Wildlife Management. 67(2):324-333.

Ratnaswamy, M.J. and Warren, R.J. 1998. Removing raccoons to protect sea turtle nests: Are there implications for ecosystem management? Wildlife Society Bulletin. 26(4):846-850.

Ricketts, T.H., E. Dinerstein, D.M. Olson, C.J. Loucks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao. P.T. Hurley, K.M. Carney, R. Abell, and S. Walters. 1999. Terrestrial ecoregions of North America: A conservation assessment. World Wildl. Fund - U.S. and Canada. Island Press. Washington, DC. 485 pp.

Riley, S.P.D., Hadidian, J., and Manski, D.A. 1998. Population density, survival, and rabies in raccoons in an urban national park. Canadian Journal of Zoology. 76(6):1153-1164.

Robbins A.H., M.D. Borden, B.S. Windmiller, M. Niezgoda, L.C. Marcus, S.M. O'Brien, S.M. Kreindel, M.W. McGuill, A. DeMaria, C.E. Rupprecht, and S. Rowell. 1998. Prevention of the spread of rabies to wildlife by oral vaccination of raccoons in Massachusetts. J. Am. Vet. Med. Assoc. Nov 15;213(10):1407-12

Rosatte, R.C., D. Donovan. M. Allan, L-A. Howes, A. Silver, K. Bennett, C. MacInnes, C. Davies, A. Wandeler, and B. Radford. 2001. Emergency response to raccoon rabies introduction in Ontario. J. Wildl. Dis. 37:265-279.

Rosatte, R.C. 2000. Management of raccoons (*Procyon lotor*) in Ontario, Canada: Do human intervention and disease have significant impact on raccoon populations? Mammalia: journal de morphologie, biologie, systematique des mammiferes. 64(4):369-390.

Rosatte, R.C., C.D. MacInnes, M.J. Power, D.H. Johnston, P. Bachman, C.P. Nunan, C. Wannop., M. Pedde, L. Calder. 1993. Tactics for the control of wildlife rabies in Ontario (Canada). Rev. Sci. Tech. Off. Int. Epiz.; 12(1):95-98.

Rosatte, R.C., M.J. Power, C.D. MacInnes, and J.B. Campbell. 1992. Trap-vaccinate-release and oral vaccination for rabies control in urban skunks, raccoons and foxes. J. Wildl. Dis.; 28(4):562-571.

Rosatte, R.C., D.R. Howard, J.B. Campbell, and C.D. MacInnes. 1990. Intramuscular vaccination of skunks and raccoons against rabies. J. Wildl. Dis.; 26(2):225-230.

Roscoe, D.E. 1993. Epizootiology of canine distemper in New Jersey raccoons. Journal of Wildlife Diseases. 29(3):390-395.

Rupprecht, C.E., L. Blass, K. Smith, L.A. Orciari, M. Niezgoda, S.G. Whitfield, R.V. Gibbons, M. Guerra, and C.A. Hanlon. 2001. Human infection due to recombinant vaccinia-rabies glycoprotein virus. N. Engl. J. Med.; 23; 345(8):582-586.

Rupprecht, C.E., L.P. Blass1, I. Krishnarao1, K. Smith, L. Orciari, M. Niezgoda, S. Whitfield, and C.A. Hanlon. *unpublished* 2000. Human exposure to a recombinant rabies vaccine. Abstract presented at the 11th Annual International Conference on Research Advances and Rabies Control in the Americas, Lima, Peru, October, 2000.

Rupprecht, C.E. and J.S. Smith. 1994. Raccoon rabies: the re-emergence of an eipozootic in a densely populated area. Seminars in Virology (5):155-264.

Rupprecht, C.E., C.A. Hanlon, H. Koprowski, and A.N. Hamir. 1992a. Oral wildlife rabies vaccination: development of a recombinant virus vaccine. Trans. 57th N. A. Wildl. & Nat. Res. Conf. 439-452.

Rupprecht, C.E., C.A. Hanlon, L.B. Cummins, and H. Koprowski. 1992b. Primate responses to a vaccinia-rabies glycoprotein recombinant virus vaccine. Vaccine 10:368-374.

Rupprecht, C.E., B. Dietzschold, J. B. Campbell, K. M. Charlton, and H. Koprowski. 1992c. Consideration of inactivated rabies vaccines as oral immunogens of wild carnivores. J. Wild. Dis. 28(4):629-635.

Rupprecht, C.E., B. Dietzschold, J.H. Cox, and L.G. Schneider. 1989. Oral vaccination of raccoons (*Procyon lotor*) with an attenuated (SAD-B_{19}) rabies virus vaccine. J. Wildl. Dis.25(4):548-554.

Rupprecht, C.E., A.N. Hamir, D.H. Johnston, and H. Koprowski. 1988. Efficacy of a vaccinia-rabies glycoprotein recombinant virus vaccine in raccoons (*Procyon lotor*). Rev. Infect. Dis. 10:Supplement 4, p. 803:809.

Rupprecht, C.E. and M.P. Kieny. 1988. Development of a vaccinia-rabies glycoprotein recombinant virus vaccine, p. 335-364 *in* Rabies, J. Campbell and K. Charlton, eds., Kluwere Acad Pub., Boston, MA.

Rupprecht, C.E., T.J. Wiktor, A.N. Hamir, B. Dietzschold, W.H. Wunner, L.T. Glickman, and H. Koprowski. 1986. Oral immunization and protection of raccoons (*Procyon lotor*) with a vaccinia rabies glycoprotein recombinant virus vaccine. Proc. Natl. Acad. Sci. USA 83:7947-7950.

Sanderson, G.C. and G.F. Hubert, Jr. 1982. Selected demographic characteristics of Illinois (U.S.A.) raccoons (*Procyon lotor*). pages 487-513 *in* J.A. Chapman and D. Pursely, eds., Worldwide furbearer conference proceedings. MD Wildl. Admin., Annapolis, MD.

Slate, D., Chipman, R.B., Rupprecht, C.E., and DeLiberto, T. 2002. Oral rabies vaccination: A national perspective on program development and implementation. Proceedings from the 20th Vertebrate Pest Conference. University of California, Davis. P. 232-240.

Stalmaster, M.V. and J.L. Kaiser. 1997. Flushing responses of wintering bald eagles to military activity. J. Wildl. Manage. 61(4)1307-1313.

Steelman, H.G., S.E. Henke, and G.M. Moore. 2000. Bait delivery for oral rabies vaccine to gray foxes. J. Wildl. Dis.; 36(4): 744-751.

TDH (Texas Department of Health), Zoonosis Control Division. 2004. The Texas Oral Rabies Vaccine Program. Information from website: www.tdh.state.tx.us/zoonosis.

Thompson, J.A. and P.J. Fleming. 1994. Evaluation of the efficacy of 1080 poisoning of red foxes using visitation to non-toxic baits as an index of fox abundance. Wildl. Res. 21:27-39.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). *undated a*. Veterinary Biologics Risk Analysis. Rabies, Vaccine, Live Vaccinia Vector (BA1901-1.298). USDA, APHIS, BBEP. 35 p. plus Appendices 1-20.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). *undated b*. Veterinary Biologics Risk Analysis. Rabies, Vaccine, Live Vaccinia Vector (BA1901-4.298). USDA, APHIS, BBEP. 40 p. plus Appendices 1-20.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2004a. Cooperative Rabies Management Program National Report 2003. USDA, APHIS, Wildlife Services. Washington, D.C. (unnumbered report) 66pp.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2004b. Monitoring Report-Calendar Year 2003-for Environmental Assessment – Oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 6213-E Angus Drive, Raleigh, NC 27617. 22p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2004c. Environmental assessment (EA) – Oral vaccination to control specific rabies virus variants in raccoons on National Forest System lands in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 63p. plus 9 appendices.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2004d. Supplemental environmental assessment (EA) – Oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 79p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2004e. Finding of no significant impact and decision for environmental assessment oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 5p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2003a. Supplemental environmental assessment (EA) – Oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 99p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2003b. Finding of no significant impact and decision for environmental assessment oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 4p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2002. Finding of no significant impact and decision for environmental assessment oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 11p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2001a. Environmental assessment (EA) – Oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 81p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Wildlife Services. 2001b. Finding of no significant impact and decision for environmental assessment oral vaccination to control specific rabies virus variants in raccoons, gray foxes, and coyotes in the United States. USDA, APHIS, Wildlife Services, 4700 River Road, Unit 87, Riverdale, MD 20737-1234. 5p.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control Program. 1997. Final Environmental Impact Statement - revised October 1997. USDA, APHIS, Wildlife Services Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD 20737-1234.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). 1995a. EA and Finding of No Significant Impact – Proposed Issuance of a Conditional United States Veterinary Biological Product License to Rhone Merieux, Inc., for Rabies Vaccine, Live Vaccinia Vector. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control Program. 1995b. Environmental Assessment and Finding of No Significant Impact – Proposed Field Application of an Experimental Rabies Vaccine, Live Vaccinia Vector, In South Texas. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). 1994a. Environmental Assessment and Finding of No Significant Impact – Proposed Field Test of an Experimental Rabies Vaccine, Vaccinia Vector, Cape Cod Canal, Massachusetts. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234. March 1994

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). 1994b. Environmental Assessment and Finding of No Significant Impact – Proposed Field Test of an Experimental Rabies Vaccine, Vaccinia Vector, Cape Cod Canal, Massachusetts. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234. October 1994

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). 1994c. Environmental Assessment and Finding of No Significant Impact – Proposed Field Test of an Experimental Rabies Vaccine, Vaccinia Vector, Northern Cape May Peninsula, New Jersey. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234. October 1994

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). 1993. Environmental Assessment and Finding of No Significant Impact – Proposed Field Test of an Experimental Rabies Vaccine, Vaccinia Vector, Northern Cape May Peninsula, New Jersey. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). 1992. Environmental Assessment and Finding of No Significant Impact – Proposed Field Trial in New Jersey of a Live Experimental Vaccinia-Vector Recombinant Rabies Vaccine for Raccoons. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234.

USDA (U.S. Department of Agriculture), Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics, and Environmental Protection (BBEP). 1991. Environmental Assessment and Finding of No Significant Impact – Proposed Field Trial in Pennsylvania of a Live Experimental Vaccinia-Vector Recombinant Rabies Vaccine for Raccoons. USDA, APHIS, BBEP, 4700 River Road, Riverdale, MD 20737-1234.

USDI (U.S. Department of the Interior)/National Park Service (NPS). 2004a. Environmental Assessment and Finding of No Significant Impact - Oral Rabies Vaccination Program (on Southeast Region NPS units). USDI/NPS, Southeastern Region, 100 Alabama St. SW, 1924 Building, Atlanta, GA 30303.

USDI (U.S. Department of Interior), Fish and Wildlife Service (USFWS). 2004b. Threatened and Endangered Species System (TESS) Threatened and Endangered Animals and Plants by State as of 8/5/04. information obtained from USFWS website: http://endangered.fws.gov/.

USDI (U.S. Department of the Interior)/National Park Service (NPS). 2003. Environmental Assessment and Finding of No Significant Impact - Oral Rabies Vaccination Program, Big Bend National Park, Guadalupe Mountains National Park, Amistad National Recreation Area, Texas. USDI/NPS, Intermountain Region, 12795 Alameda Parkway, Denver, CO 80225.

USDI (U.S. Department of Interior), Fish and Wildlife Service (USFWS). 2000a. Final Rule. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status of the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule. 50 CFR Part 17, March 24, 2000.

USDI (U.S. Department of Interior)/National park Service (NPS). 2000b. NPS Management Policies 2001. NPS Office of Policy, 1849 C Street, NW, Room 2414, Washington, DC 20240. NPS D1416-December 2000. http://www.nps.gov/refdesk/policies.html. 141 p.

USDI (U.S. Department of the Interior)/National Park Service (NPS). 1995. Report of effects of aircraft overflights on the National Park System. USDI-NPS D-1062, July, 1995.

Wandeler, A.I. 1991. Oral immunization of wildlife. p. 485-505 *in* The natural history of rabies, 2nd ed., GM Baer, ed, CRC Press, Boca Raton, FL.

Watson, J.W. 1993. Responses of nesting bald eagles to helicopter surveys. Wildl. Soc. Bull. 21:171-178.

White, C.M. and S.K. Sherrod. 1973. Advantages and disadvantages of the use of rotor-winged aircraft in raptor surveys. Raptor Research 7:97-104.

White, C.M. and T.L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. Condor 87:14-22.

Woodruff, B.A. and Jones, J.L. 1987. Human exposure to rabies from pet wild raccoons in South Carolina and West Virginia, 1987 through 1988. American Journal of Public Health. 81(10): 1328-1330.

APPENDIX C
SPECIES LISTED AS THREATENED OR ENDANGERED UNDER THE ENDANGERED SPECIES ACT

Connecticut -- 12 listings

Animals – 10

T Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T Sea turtle, green (except where endangered) (*Chelonia mydas*)
E Sea turtle, hawksbill (*Eretmochelys imbricata*)
E Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E Sea turtle, leatherback (*Dermochelys coriacea*)
T Sea turtle, loggerhead (*Caretta caretta*)
E Sturgeon, shortnose (*Acipenser brevirostrum*)
E Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T Tiger beetle, Puritan (*Cicindela puritana*)
T Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E Wedgemussel, dwarf (*Alasmidonta heterodon*)
E Whale, finback (*Balaenoptera physalus*)
E Whale, right (*Balaena glacialis (incl. australis)*)
T Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 2

E Gerardia, sandplain (*Agalinis acuta*)
T Pogonia, small whorled (*Isotria medeoloides*)

Georgia -- 66 listings

Animals -- 43

E Acornshell, southern (Epioblasma othcaloogensis)
T(S/A) Alligator, American (Alligator mississippiensis)
T Bankclimber, purple (mussel) (Elliptoideus sloatianus)
E Bat, gray (Myotis grisescens)
E Bat, Indiana (Myotis sodalis)
E Clubshell, southern (Pleurobema decisum)
E Combshell, upland (Epioblasma metastriata)
E Darter, amber (Percina antesella)
T Darter, Cherokee (Etheostoma scotti)
E Darter, Etowah (Etheostoma etowahae)
T Darter, goldline (Percina aurolineata)
T Darter, snail (Percina tanasi)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
E Kidneyshell, triangular (Ptychobranchus greeni)
E Logperch, Conasauga (Percina jenkinsi)
E Manatee, West Indian (Trichechus manatus)
T Moccasinshell, Alabama (Medionidus acutissimus)
E Moccasinshell, Coosa (Medionidus parvulus)
E Moccasinshell, Gulf (Medionidus penicillatus)
E Moccasinshell, Ochlockonee (Medionidus simpsonianus)
XN Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma capsaeformis)
E Pigtoe, oval (Pleurobema pyriforme)
E Pigtoe, southern (Pleurobema georgianum)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
T Pocketbook, finelined (Lampsilis altilis)
E Pocketbook, shinyrayed (Lampsilis subangulata)
XN Riversnail, Anthony's AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Athearnia anthonyi)
T Salamander, flatwoods (Ambystoma cingulatum)
T Sea turtle, green (except where endangered) (Chelonia mydas)
E Sea turtle, hawksbill (Eretmochelys imbricata)
E Sea turtle, Kemp's ridley (Lepidochelys kempii)
E Sea turtle, leatherback (Dermochelys coriacea)
T Sea turtle, loggerhead (Caretta caretta)
T Shiner, blue (Cyprinella caerulea)
T Snake, eastern indigo (Drymarchon corais couperi)
E Stork, wood (AL, FL, GA, SC) (Mycteria americana)
E Sturgeon, shortnose (Acipenser brevirostrum)
T Tern, roseate (Western Hemisphere except NE U.S.) (Sterna dougallii dougallii)
T(S/A) Turtle, bog (=Muhlenberg) (southern) (Clemmys muhlenbergii)
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
E Whale, right (Balaena glacialis (incl. australis))
E Woodpecker, red-cockaded (Picoides borealis)

Plants -- 23

T Amphianthus, little (Amphianthus pusillus)
E Rattleweed, hairy (Baptisia arachnifera)
E Leather flower, Alabama (Clematis socialis)
E Coneflower, smooth (Echinacea laevigata)
T Pink, swamp (Helonias bullata)
E Quillwort, black spored (Isoetes melanospora)
E Quillwort, mat-forming (Isoetes tegetiformans)
T Pogonia, small whorled (Isotria medeoloides)
E Pondberry (Lindera melissifolia)
T Button, Mohr's Barbara (Marshallia mohrii)
E Dropwort, Canby's (Oxypolis canbyi)
E Harperella (Ptilimnium nodosum)
E Sumac, Michaux's (Rhus michauxii)
T Water-plantain, Kral's Sagittaria secundifolia)
E Pitcher-plant, green (Sarracenia oreophila)
E Chaffseed, American (Schwalbea americana)
T Skullcap, large-flowered (Scutellaria montana)
E Campion, fringed (Silene polypetala)
T Spiraea, Virginia (Spiraea virginiana)
E Torreya, Florida (Torreya taxifolia)
E Trillium, persistent (Trillium persistens)
E Trillium, relict (Trillium reliquum)
E Grass, Tennessee yellow-eyed (Xyris tennesseensis)

Maine -- 15 listings

Animals -- 12

T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T Lynx, Canada (lower 48 States DPS) (Lynx canadensis)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E Salmon, Atlantic Gulf of Maine Atlantic Salmon DPS (Salmo salar)
E Sea turtle, leatherback (Dermochelys coriacea)
E Sturgeon, shortnose (Acipenser brevirostrum)
E Tern, roseate (northeast U.S. nesting pop.) (Sterna dougallii dougallii)
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
E Whale, right (Balaena glacialis (incl. australis))
T Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants -- 3

T Pogonia, small whorled (Isotria medeoloides)
E Lousewort, Furbish (Pedicularis furbishiae)
T Orchid, eastern prairie fringed (Platanthera leucophaea)

Maryland -- 26 listings

Animals -- 19

E Bat, Indiana (Myotis sodalis)
E Darter, Maryland (Etheostoma sellare)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
T Sea turtle, green (except where endangered) (Chelonia mydas)
E Sea turtle, hawksbill (Eretmochelys imbricata)
E Sea turtle, Kemp's ridley (Lepidochelys kempii)
E Sea turtle, leatherback (Dermochelys coriacea)
TSea turtle, loggerhead (Caretta caretta)
E Squirrel, Delmarva Peninsula fox (except Sussex Co., DE) (Sciurus niger cinereus)
E Sturgeon, shortnose (Acipenser brevirostrum)
T Tiger beetle, northeastern beach (Cicindela dorsalis dorsalis)
TTiger beetle, Puritan (Cicindela puritana)
T Turtle, bog (=Muhlenberg) (northern) (Clemmys muhlenbergii)
E Wedgemussel, dwarf (Alasmidonta heterodon)
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
E Whale, right (Balaena glacialis (incl. australis))

Plants -- 7

TJoint-vetch, sensitive (Aeschynomene virginica)
E Gerardia, sandplain (Agalinis acuta)
T Amaranth, seabeach (Amaranthus pumilus)
T Pink, swamp (Helonias bullata)
E Dropwort, Canby's (Oxypolis canbyi)
E Harperella (Ptilimnium nodosum)
E Bulrush, Northeastern (Scirpus ancistrochaetus)

Massachusetts -- 24 listings

Animals -- 21

E Beetle, American burying (Nicrophorus americanus)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E Sea turtle, hawksbill (Eretmochelys imbricata)
E Sea turtle, Kemp's ridley (Lepidochelys kempii)
E Sea turtle, leatherback (Dermochelys coriacea)
T Sea turtle, loggerhead (Caretta caretta)
E Sturgeon, shortnose (Acipenser brevirostrum)
E Tern, roseate (northeast U.S. nesting pop.) (Sterna dougallii dougallii)
T Tiger beetle, northeastern beach (Cicindela dorsalis dorsalis)
T Tiger beetle, Puritan (Cicindela puritana)
T Turtle, bog (=Muhlenberg) (northern) (Clemmys muhlenbergii)
E Turtle, Plymouth redbelly (Pseudemys rubriventris bangsi)
E Wedgemussel, dwarf (Alasmidonta heterodon)
E Whale, blue (Balaenoptera musculus)
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
E Whale, right (Balaena glacialis (incl. australis))
E Whale, Sei (Balaenoptera borealis)
T Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants -- 3

E Gerardia, sandplain (Agalinis acuta)
T Pogonia, small whorled (Isotria medeoloides)
EBulrush, Northeastern (Scirpus ancistrochaetus)

New Hampshire -- 13 listings

Animals -- 10

E Butterfly, Karner blue (Lycaeides melissa samuelis)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T Lynx, Canada (lower 48 States DPS) (Lynx canadensis)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E Sea turtle, leatherback (Dermochelys coriacea)
T Tiger beetle, Puritan (Cicindela puritana)
E Wedgemussel, dwarf (Alasmidonta heterodon)
E Whale, finback (Balaenoptera physalus)
T Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants -- 3

E Milk-vetch, Jesup's (Astragalus robbinsii var. jesupi)
T Pogonia, small whorled (Isotria medeoloides)
EBulrush, Northeastern (Scirpus ancistrochaetus)

New Jersey -- 23 listings

Animals -- 17

E Bat, Indiana (Myotis sodalis)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E Sea turtle, hawksbill (Eretmochelys imbricata)
E Sea turtle, Kemp's ridley (Lepidochelys kempii)
E Sea turtle, leatherback (Dermochelys coriacea)
T Sea turtle, loggerhead (Caretta caretta)
E Sturgeon, shortnose (Acipenser brevirostrum)
E Tern, roseate (northeast U.S. nesting pop.) (Sterna dougallii dougallii)
T Tiger beetle, northeastern beach (Cicindela dorsalis dorsalis)
T Turtle, bog (=Muhlenberg) (northern) (Clemmys muhlenbergii)
E Wedgemussel, dwarf (Alasmidonta heterodon)
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
E Whale, right (Balaena glacialis (incl. australis))
T Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants -- 6

T Joint-vetch, sensitive (Aeschynomene virginica)
T Amaranth, seabeach (Amaranthus pumilus)
T Pink, swamp (Helonias bullata)
T Pogonia, small whorled (Isotria medeoloides)
T Beaked-rush, Knieskern's (Rhynchospora knieskernii)
EChaffseed, American (Schwalbea Americana)

New York -- 27 listings

Animals -- 21

E Bat, Indiana (Myotis sodalis)
E Butterfly, Karner blue (Lycaeides melissa samuelis)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T Lynx, Canada (lower 48 States DPS) (Lynx canadensis)
E Plover, piping (Great Lakes watershed) (Charadrius melodus)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
T Sea turtle, green (except where endangered) (Chelonia mydas)
E Sea turtle, hawksbill (Eretmochelys imbricata)
E Sea turtle, Kemp's ridley (Lepidochelys kempii)
E Sea turtle, leatherback (Dermochelys coriacea)
T Sea turtle, loggerhead (Caretta caretta)
T Snail, Chittenango ovate amber (Succinea chittenangoensis)
E Sturgeon, shortnose (Acipenser brevirostrum)
E Tern, roseate (northeast U.S. nesting pop.) (Sterna dougallii dougallii)
T Turtle, bog (=Muhlenberg) (northern) (Clemmys muhlenbergii)
E Wedgemussel, dwarf (Alasmidonta heterodon)
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
E Whale, right (Balaena glacialis (incl. australis))
T Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants – 6

T Monkshood, northern wild (Aconitum noveboracense)
E Gerardia, sandplain (Agalinis acuta)
T Amaranth, seabeach (Amaranthus pumilus)
T Fern, American hart's-tongue (Asplenium scolopendrium var. americanum)
T Roseroot, Leedy's (Sedum integrifolium ssp. leedyi)
TGoldenrod, Houghton’s (Solidago houghtonii)

North Carolina – 63 listings

Animals -- 36

T	Alligator, American (*Alligator mississippiensis*)
E	Bat, Indiana (*Myotis sodalis*)
E	Bat, Virginia big-eared (*Corynorhinus (=Plecotus) townsendii virginianus*)
E	Butterfly, Saint Francis' satyr (*Neonympha mitchellii francisci*)
T	Chub, spotfin Entire (*Cyprinella monacha*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Elktoe, Appalachian (*Alasmidonta raveneliana*)
E	Heelsplitter, Carolina (*Lasmigona decorata*)
XN	Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)
E	Pearlymussel, littlewing (*Pegias fabula*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Shiner, Cape Fear (*Notropis mekistocholas*)
T	Silverside, Waccamaw (*Menidia extensa*)
T	Snail, noonday (*Mesodon clarki nantahala*)
E	Spider, spruce-fir moss (*Microhexura montivaga*)
E	Spinymussel, James (*Pleurobema collina*)
E	Spinymussel, Tar River (*Elliptio steinstansana*)
E	Squirrel, Carolina northern flying (*Glaucomys sabrinus coloratus*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T	Tern, roseate (Western Hemisphere except NE U.S.) (*Sterna dougallii dougallii*)
T	Turtle, bog (=Muhlenberg) (southern) (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Whale, sperm (*Physeter catodon (=macrocephalus*
E	Wolf, red (except where XN) (*Canis rufus*)
XN	Wolf, red [XN] (*Canis rufus*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 27

T	Joint-vetch, sensitive (*Aeschynomene virginica*)
T	Amaranth, seabeach (*Amaranthus pumilus*)
E	Bittercress, small-anthered (*Cardamine micranthe*
E	Sedge, golden (*Carex lutea*)
E	Coneflower, smooth (*Echinacea laevigata*)
E	Avens, spreading (*Geum radiatum*)
E	Lichen, rock gnome (*Gymnoderma lineare*)
E	Bluet, Roan Mountain (*Hedyotis purpurea* var. *mo*
E	Sunflower, Schweinitz's (*Helianthus schweinitzii*)
T	Pink, swamp (*Helonias bullata*)
T	Heartleaf, dwarf-flowered (*Hexastylis naniflora*)
T	Heather, mountain golden (*Hudsonia montana*)
T	Pogonia, small whorled (*Isotria medeoloides*)
T	Blazingstar, Heller's (*Liatris helleri*)
E	Pondberry (*Lindera melissifolia*)
E	Loosestrife, rough-leaved (*Lysimachia asperulaefo*
E	Dropwort, Canby's (*Oxypolis canbyi*)
E	Harperella (*Ptilimnium nodosum*)
E	Sumac, Michaux's (*Rhus michauxii*)
E	Arrowhead, bunched (*Sagittaria fasciculata*)
E	Pitcher-plant, green (*Sarracenia oreophila*)
E	Pitcher-plant, mountain sweet (*Sarracenia rubra* ss *jonesii*)
E	Chaffseed, American (*Schwalbea americana*)
E	Irisette, white (*Sisyrinchium dichotomum*)
T	Goldenrod, Blue Ridge (*Solidago spithamaea*)
T	Spiraea, Virginia (*Spiraea virginiana*)
E	Meadowrue, Cooley's (*Thalictrum cooleyi*)

Pennsylvania -- 17 listings

Animals -- 14

E	Bat, Indiana (Myotis sodalis)
E	Clubshell Entire Range; Except where listed as Experimental Populations (Pleurobema clava)
T	Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
E	Mucket, pink (pearlymussel) (Lampsilis abrupta)
E	Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (Hemistena lata)
E	Pigtoe, rough (Pleurobema plenum)
E	Pimpleback, orangefoot (pearlymussel) (Plethobasus cooperianus)
E	Plover, piping (Great Lakes watershed) (Charadrius melodus)
E	Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E	Riffleshell, northern (Epioblasma torulosa rangiana)
E	Ring pink (mussel) (Obovaria retusa)
T	Turtle, bog (=Muhlenberg) (northern) (Clemmys muhlenbergii)
E	Wedgemussel, dwarf (Alasmidonta heterodon)
T	Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants -- 3

T	Pogonia, small whorled (Isotria medeoloides)
E	Bulrush, Northeastern (Scirpus ancistrochaetus)
T	Spiraea virginia (Spiraea viginiana)

Tennessee -- 96 listings

Animals -- 76

E Acornshell, southern (Epioblasma othcaloogensis)
E Bat, gray (Myotis grisescens)
E Bat, Indiana (Myotis sodalis)
E Bean, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (Villosa trabalis)
XN Bean, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Villosa trabalis)
E Bean, purple (Villosa perpurpurea)
E Blossom, green (pearlymussel) (Epioblasma torulosa gubernaculum)
E Blossom, tubercled (pearlymussel) Entire Range; Except where listed as Experimental Populations (Epioblasma torulosa torulosa)
XN Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma torulosa torulosa)
E Blossom, turgid (pearlymussel) Entire Range; Except where listed as Experimental Populations (Epioblasma turgidula)
XN Blossom, turgid (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL Epioblasma turgidula)
E Blossom, yellow (pearlymussel) Entire Range; Except where listed as Experimental Populations (Epioblasma florentina florentina)
XN Blossom, yellow (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma florentina florentina)
E Catspaw (=purple cat's paw pearlymussel) Entire Range; Except where listed as Experimental Populations (Epioblasma obliquata obliquata)
XN Catspaw (=purple cat's paw pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma obliquata obliquata)
T Chub, slender (Erimystax cahni)
T Chub, spotfin Entire (Cyprinella monacha)
E Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (Epioblasma brevidens)
XN Combshell, Cumberlandian AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma brevidens)
E Combshell, upland (Epioblasma metastriata)
E Crayfish, Nashville (Orconectes shoupi)
T Dace, blackside (Phoxinus cumberlandensis)
E Darter, amber (Percina antesella)
E Darter, bluemask (=jewel) (Etheostoma /)
E Darter, boulder (Etheostoma wapiti)
E Darter, duskytail Entire (Etheostoma percnurum)
T Darter, slackwater (Etheostoma boschungi)
T Darter, snail (Percina tanasi)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
E Elktoe, Appalachian (Alasmidonta raveneliana)
E Elktoe, Cumberland (Alasmidonta atropurpurea)
E Fanshell (Cyprogenia stegaria)
E Kidneyshell, triangular (Ptychobranchus greeni)
E Lampmussel, Alabama Entire Range; Except where listed as Experimental Populations (Lampsilis virescens)
E Lilliput, pale (pearlymussel) (Toxolasma cylindrellus)
E Logperch, Conasauga (Percina jenkinsi)
E Madtom, pygmy (Noturus stanauli)
E Madtom, smoky Entire (Noturus baileyi)
XN Madtom, yellowfin Holston River, VA, TN (Noturus flavipinnis)
T Madtom, yellowfin (except where XN) (Noturus flavipinnis)
E Mapleleaf, winged (mussel) Entire; except where listed as experimental populations (Quadrula fragosa)
E Marstonia, royal (snail) (Pyrgulopsis ogmorhaphe)
E Moccasinshell, Coosa (Medionidus parvulus)
E Monkeyface, Appalachian (pearlymussel) (Quadrula sparsa)
E Monkeyface, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (Quadrula intermedia)
XN Monkeyface, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Quadrula intermedia)
E Mucket, pink (pearlymussel) Lampsilis abrupta)
E Mussel, oyster Entire Range; Except where listed as Experimental Populations (Epioblasma capsaeformis)
XN Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma capsaeformis)
E Pearlymussel, birdwing Entire Range; Except where listed as Experimental Populations (Conradilla caelata)
E Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (Hemistena lata)
E Pearlymussel, dromedary Entire Range; Except where listed as Experimental Populations (Dromus dromas)
E Pearlymussel, littlewing (Pegias fabula)
E Pigtoe, Cumberland (Pleurobema gibberum)
E Pigtoe, finerayed Entire Range; Except where listed as Experimental Populations (Fusconaia cuneolus)
XN Pigtoe, finerayed AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Fusconaia cuneolus)
E Pigtoe, rough (Pleurobema plenum)
E Pigtoe, shiny Entire Range; Except where listed as Experimental Populations (Fusconaia cor)
XN Pigtoe, shiny AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Fusconaia cor)
E Pigtoe, southern (Pleurobema georgianum)

E Pimpleback, orangefoot (pearlymussel) (Plethobasus cooperianus)
T Pocketbook, finelined (Lampsilis altilis)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E Rabbitsfoot, rough (Quadrula cylindrica strigillata)
E Riffleshell, tan (Epioblasma florentina walkeri (=E. walkeri))
E Ring pink (mussel) (Obovaria retusa)
E Riversnail, Anthony's Entire Range; Except where listed as Experimental Populations (Athearnia anthonyi)
XN Riversnail, Anthony's AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Athearnia anthonyi)
T Shiner, blue (Cyprinella caerulea)
T Snail, painted snake coiled forest (Anguispira picta)
E Spider, spruce-fir moss (Microhexura montivaga)
E Squirrel, Carolina northern flying (Glaucomys sabrinus coloratus)
E Sturgeon, pallid (Scaphirhynchus albus)
E Tern, least (interior pop.) (Sterna antillarum)
E Wartyback, white (pearlymussel) (Plethobasus cicatricosus)
XN Wolf, red [XN] (Canis rufus)

Plants -- 20

T Potato-bean, Price's (Apios priceana)
E Rock-cress, Braun's (Arabis perstellata)
E Sandwort, Cumberland (Arenaria cumberlandensis)
T Fern, American hart's-tongue (Asplenium scolopendrium var. americanum)
E Ground-plum, Guthrie's (=Pyne's) (Astragalus bibullatus)
T Rosemary, Cumberland (Conradina verticillata)
E Prairie-clover, leafy (Dalea foliosa)
E Coneflower, Tennessee purple (Echinacea tennesseensis)
E Avens, spreading (Geum radiatum)
E Lichen, rock gnome (Gymnoderma lineare)
E Bluet, Roan Mountain (Hedyotis purpurea var. montana)
T Sunflower, Eggert's (Helianthus eggertii)
T Pogonia, small whorled (Isotria medeoloides)
E Bladderpod, Spring Creek (Lesquerella perforata)
E Aster, Ruth's golden (Pityopsis ruthii)
E Pitcher-plant, green (Sarracenia oreophila)
T Skullcap, large-flowered (Scutellaria montana)
T Goldenrod, Blue Ridge (Solidago spithamaea)
T Spiraea, Virginia (Spiraea virginiana)
E Grass, Tennessee yellow-eyed (Xyris tennesseensis)

Vermont -- 9 listings

Animals -- 7

E Bat, Indiana (Myotis sodalis)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T Lynx, Canada (lower 48 States DPS) (Lynx canadensis)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
T Tiger beetle, Puritan (Cicindela puritana)
E Wedgemussel, dwarf (Alasmidonta heterodon)
T Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants -- 2

E Milk-vetch, Jesup's (Astragalus robbinsii var. jesupi)
E Bulrush, Northeastern (Scirpus ancistrochaetus)

Virginia -- 71 listings

Animals -- 56

E Bat, gray (Myotis grisescens)
E Bat, Indiana (Myotis sodalis)
E Bat, Virginia big-eared (Corynorhinus (=Plecotus) townsendii virginianus)
XN Bean, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Villosa trabalis)
E Bean, purple (Villosa perpurpurea)
E Blossom, green (pearlymussel) (Epioblasma torulosa gubernaculum)
T Chub, slender (Erimystax cahni)
T Chub, spotfin Entire (Cyprinella monacha)
E Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (Epioblasma brevidens)
XN Combshell, Cumberlandian AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma brevidens)
E Darter, duskytail Entire (Etheostoma percnurum)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
E Fanshell (Cyprogenia stegaria)
E Isopod, Lee County cave (Lirceus usdagalun)
T Isopod, Madison Cave (Antrolana lira)
E Logperch, Roanoke (Percina rex)
XN Madtom, yellowfin Holston River, VA, TN (Noturus flavipinnis)
T Madtom, yellowfin (except where XN) (Noturus flavipinnis)
E Monkeyface, Appalachian (pearlymussel) (Quadrula sparsa)
E Monkeyface, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (Quadrula intermedia)
XN Monkeyface, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Quadrula intermedia)

E Mucket, pink (pearlymussel) (Lampsilis abrupta)
E Mussel, oyster Entire Range; Except where listed as Experimental Populations (Epioblasma capsaeformis)
XN Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma capsaeformis)
E Pearlymussel, birdwing Entire Range; Except where listed as Experimental Populations (Conradilla caelata)
E Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (Hemistena lata)
E Pearlymussel, dromedary Entire Range; Except where listed as Experimental Populations (Dromus dromas)
E Pearlymussel, littlewing (Pegias fabula)
E Pigtoe, finerayed Entire Range; Except where listed as Experimental Populations (Fusconaia cuneolus)
XN Pigtoe, finerayed AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Fusconaia cuneolus)
E Pigtoe, rough (Pleurobema plenum)
E Pigtoe, shiny Entire Range; Except where listed as Experimental Populations (Fusconaia cor)
XN Pigtoe, shiny AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Fusconaia cor)
T Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E Rabbitsfoot, rough (Quadrula cylindrica strigillata)
E Riffleshell, tan (Epioblasma florentina walkeri (=E. walkeri))
E Salamander, Shenandoah (Plethodon shenandoah)
T Sea turtle, green (except where endangered) (Chelonia mydas)
E Sea turtle, hawksbill (Eretmochelys imbricata)
E Sea turtle, Kemp's ridley (Lepidochelys kempii)
E Sea turtle, leatherback (Dermochelys coriacea)
T Sea turtle, loggerhead (Caretta caretta)
E Snail, Virginia fringed mountain (Polygyriscus virginianus)
E Spinymussel, James (Pleurobema collina)
E Squirrel, Delmarva Peninsula fox (except Sussex Co., DE) (Sciurus niger cinereus)
E Squirrel, Virginia northern flying (Glaucomys sabrinus fuscus)
E Sturgeon, shortnose (Acipenser brevirostrum)
E Tern, roseate (northeast U.S. nesting pop.) (Sterna dougallii dougallii)
T Tiger beetle, northeastern beach (Cicindela dorsalis dorsalis)
T(S/A) Turtle, bog (=Muhlenberg) (southern) (Clemmys muhlenbergii)
E Wedgemussel, dwarf (Alasmidonta heterodon)
E Whale, finback (Balaenoptera physalus)
E Whale, humpback (Megaptera novaeangliae)
E Whale, right (Balaena glacialis (incl. australis))
E Woodpecker, red-cockaded (Picoides borealis)

Plants -- 15

TJoint-vetch, sensitive (Aeschynomene virginica)
T Amaranth, seabeach (Amaranthus pumilus)
E Rock-cress, shale barren (Arabis serotina)
T Birch, Virginia round-leaf (Betula uber)
E Bittercress, small-anthered (Cardamine micranthera)
E Coneflower, smooth (Echinacea laevigata)
T Sneezeweed, Virginia (Helenium virginicum)
T Pink, swamp (Helonias bullata)
E Mallow, Peter's Mountain (Iliamna corei)
T Pogonia, small whorled (Isotria medeoloides)
T Orchid, eastern prairie fringed (Platanthera leucophaea)
E Harperella (Ptilimnium nodosum)
E Sumac, Michaux's (Rhus michauxii)
E Bulrush, Northeastern (Scirpus ancistrochaetus)
TSpiraea virginia (Spiraea virginiana)

West Virginia -- 21 listings

Animals -- 15

E Bat, gray (Myotis grisescens)
E Bat, Indiana (Myotis sodalis)
E Bat, Virginia big-eared (Corynorhinus (=Plecotus) townsendii virginianus)
E Blossom, tubercled (pearlymussel) Entire Range; Except where listed as Experimental Populations (Epioblasma torulosa torulosa)
XN Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (Epioblasma torulosa torulosa)
E Clubshell Entire Range; Except where listed as Experimental Populations (Pleurobema clava)
T Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
E Fanshell (Cyprogenia stegaria)
E Mucket, pink (pearlymussel) (Lampsilis abrupta)
E Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E Riffleshell, northern (Epioblasma torulosa rangiana)
T Salamander, Cheat Mountain (Plethodon nettingi)
T Snail, flat-spired three-toothed (Triodopsis platysayoides)
E Spinymussel, James (Pleurobema collina)
E Squirrel, Virginia northern flying (Glaucomys sabrinus fuscus)

Plants -- 6

E Rock-cress, shale barren (Arabis serotina)
T Pogonia, small whorled (Isotria medeoloides)
E arperella (Ptilimnium nodosum)
E Bulrush, Northeastern (Scirpus ancistrochaetus)
T Spiraea, Virginia (Spiraea virginiana)
E Clover, running buffalo (Trifolium stoloniferum)

Number of State Listed Species by Category

State	Mammals	Birds	Reptiles	Amphibians	Fish	Invertebrates	Plants
Connecticut	2E, 9SC **gray wolf, eastern puma**	21E, 9T, 20SC	4E, 3T, 4SC	1E, 3T, 3SC	3E, 2T, 2SC	17E, 24T, 128SC	119E, 38T, 186SC
Georgia	7E, 1T, 1R **eastern puma, Florida panther, round-tailed muskrat**	6E, 2T, 7R	3E, 7T, 2R, 1U	2T, 5R	16E, 18T, 19R, 2U	13E, 4T	38E, 49T, 12R, 7U
Maine	1T	9E, 6T	3E, 2T	0	1T	6E,6T	88E, 98T, 105SC
Maryland	11E, 7I **North American porcupine, bobcat, least weasel, Delmarva fox squirrel, New England cottontail**	14E, 4T, 8I	7E, 3T, 1I	5E, 1T, 2I	6E, 7T, 3I	27E, 5T, 8I	265E, 79T
Massachusetts	7E, 4SC	12E, 6T, 10SC	8E, 5T, 3SC	2T, 4SC	4E, 2T, 4SC	29E, 25T, 58SC	61E, 32T, 11SC
New Hampshire	2E, 1T **Canada lynx, American marten**	12E, 7T	1E, 1T	1E	2E	6E, 3T	130E, 146T, 11SC
New Jersey	9E **bobcat**	17E, 16T	8E, 3T	3E, 3T	1E	9E, 8T	0
New York	10E, 1T, 3SC **Canada lynx, New England cottontail, gray wolf, eastern puma**	10E, 10T, 19SC	7E, 5T, 6SC	2E, 7SC	8E, 11T, 5SC	16E, 8T, 18SC	4E, 7T
North Carolina	6E, 2T, 11SC **eastern puma, Carolina northern flying squirrel**	8E, 4T, 16SC	5E, 4T, 11SC	1E, 4T, 12SC	9E, 13T, 27SC	23E, 20T, 38SC	96E, 45T, 20SC
Pennsylvania	3E, 3T **Delmarva fox squirrel**	11E, 5T	3E, 2T	3E, 1T	8E, 10T	2SC	13E, 5T
Tennessee	3E, 14SM **Carolina northern flying squirrel**	4E, 4T, 21SM	3T, 4SM	1T, 10SM	20E, 17T, 40SM	51E, 4T, 1SM	196E, 133T, 186S
Vermont	4E, 1T, 4SC **Canada lynx, eastern cougar, American marten, New England cottontail**	9E, 3T, 19SC	3E, 1T, 6SC	1E, 5SC	4E, 2T, 12SC	8E, 6T, 12SC	61E, 90T
Virginia	18E, 1T, 3SC	6E,	6E, 4T,	1T, 9SC	7E, 13T,	36E, 12T,	56E,

	Delmarva fox squirrel, eastern puma, gray wolf, snowshoe hare, Virginia northern flying squirrel, marsh rabbit, northern river otter	8T, 31SC	1SC		17SC	18SC	28T, 11SC
West Virginia	6S1, 11S2, 5S3 **West Virginia northern flying squirrel, eastern spotted skunk, Appalachian cottontail**	28S1, 15S2, 15S3	3S1, 9S2, 6S3	6S1, 7S2, 5S3	26S1, 26S2, 20S3	173S1, 80S2, 26S3	267S1, 136S2, 27S3

SC=Species of Concern or Special Concern; SI="Special Interest" Species; E=State Endangered; T=State Threatened; SM=Species in Need of Management; I=In need of Conservation; R=Rare; U=Unusual; S1, S2, or S3=WV designations for levels of concern.

State	T&E Protections under State Law
Connecticut	**Act prohibits the taking of an endangered or threatened species for the purposed of selling, offering for sale, transporting for commercial gain or export. The Federal Endangered Species Act applies to federal endangered and federal threatened species, and supersedes the Connecticut Endangered Species Act for these species. Potential impacts to federally listed species may require additional consultation with the USFWS**
Georgia	**species are listed as endangered, threatened, rare or unusual and are given this status under the Georgia Endangered wildlife Act of 1973.**
Maine	**unlawful to "hunt, take or trap" any endangered or threatened species without a permit issued for specific action by the commissioner or the state of Maine.**
Maryland	**state law defines "take" similar to ESA; endangered and threatened categories have protections against "take".**
Massachusetts	**"take" defined similar to ESA; threatened, endangered, and "special concern" categories have equal protections against "take".**
New Hampshire	**unlawful for any person to take, possess, transport or sell wildlife deemed by the executive director to be in need of conservation pursuant to this section**
New Jersey	**unlawful to "take" any endangered species of fish or wildlife; "take" defined similar to ESA; no exemptions or permits to allow for incidental take.**
New York	**endangered and threatened categories have protections against "take"; "special concern" category has no special additional protection.**
North Carolina	**"Take" includes all operations during, immediately preparatory and immediately subsequent to an attempt, whether successful or not, to capture, kill, pursue, hunt or otherwise harm or reduce to possession any fisheries resources or wildlife resources. It is unlawful to "take" any endangered or threatened species of fish or wildlife.**
Pennsylvania	**endangered and threatened categories have protections against "take."**
Tennessee	**unlawful to take, possess, transport, export or ship any endangered or threatened species without permit; regulations allow provisions for "take" to alleviate damage and to protect human health and safety.**
Vermont	**unlawful to "take" any endangered or threatened species without the issuance of a permit; "take" not specifically defined; state law includes all federally listed species as state listed.**
Virginia	**unlawful to "take" any endangered or threatened species of fish or wildlife; "take" defined same as federal ESA; no exemptions or permits to allow for incidental take.**
West Virginia	**only lists federal T&E species as having protections; "Species of Concern" are listed, but have no legal status other than those that are already federally listed.**

APPENDIX E
ECOREGION DESIGNATIONS WITHIN STATES INVOLVED IN ORV PROGRAMS

Ecoregions are ecosystems of regional extent as defined by Bailey (1995). An "X" means the state contains the ecosystem/ecoregion described in the key below. The reader is referred to Bailey (1995) for more detailed descriptions of each ecoregion and the climate, soils, vegetation, and animal life that occur there.

State	Ecoregion Designation Number (Bailey 1995) (See Key Below)							
	212	M212	221	222	M221	231	232	234
Maine	X	X	X					
New Hampshire		X	X					
Vermont	X	X						
Massachusetts		X	X					
New York	X	X	X	X				
Pennsylvania	X		X		X			
New Jersey			X					
Maryland			X		X	X	X	
West Virginia			X		X			
Virginia					X	X	X	
Tennessee			X	X	X	X		X
North Carolina					X	X	X	
Georgia					X	X	X	

Key to Ecoregion Designations (adapted from descriptions by Bailey 1995):

Numbers in the 200 series are within the "Humid Temperate Domain":

212 Laurentian Mixed Forest Province – lower elevation areas (sea level to 2,400 ft.), flat to rolling hills in relief, moderately long and severe winters; native vegetation types are transitional between spruce-fir coniferous boreal forest and broadleaf deciduous forest zones and are characterized by mixed stands of coniferous (mainly pine) species and a few deciduous species (mainly yellow birch, sugar maple, and American beech); in some areas, other tree species include hemlock, red cedar.

M212 Adirondack-New England Mixed Forest-Coniferous Forest-Alpine Meadow Province – mountainous region with elevations between 500 and 4000 ft.; warm summers and sometimes cold winters; native vegetation types transitional between boreal spruce-fir coniferous forest to the north and deciduous forest to the south; valleys contain hardwood forest (sugar maple, yellow birch, beech, hemlock), lower mountain slopes with mixed forest of spruce, fir, maple, beech, and birch, and higher elevations with fir and spruce.

221 Eastern Broadleaf Forest (Oceanic) Province – diverse topography; elevations from 1000 to 3000 ft.; cold winters and warm summers; native vegetation characterized by temperate deciduous forest dominated by tall broadleaf trees that provide a dense, continuous canopy in summer and shed their leaves in winter; dominant deciduous species include American beech, yellow-poplar, basswoods, sugar maple, buckeye, red oak, white oak, hemlock; includes areas of pine-oak forest ("Pine Barrens").

222 Eastern Broadleaf Forest (Continental) Province – flat to rolling to moderate in relief; elevations from 80 to 1,650 ft.; hot summers; native vegetation dominated by broadleaf deciduous forest with oak and hickory tree species more abundant than in other provinces; gradually turns more to prairie towards the

Midwest, forming a mosaic pattern with prairie.

M221 Central Appalachian Broadleaf Forest - Coniferous Forest - Meadow Province – low mountains at elevations ranging from 300 to 6,700 ft.; distinct summers and winters; native vegetation characterized by mixed oak-pine forest, dominated by the white and black oak groups at lower levels; northeastern hardwood forest at mid elevation levels, and spruce-fir forest and meadows on the highest peaks.

231 Southeastern Mixed Forest Province – comprised of the Piedmont and irregular Gulf Coastal Plains with elevations from 100 to 1000 feet and flat to gentle sloping relief; mild winters, hot humid summers; native vegetation comprised of broadleaf deciduous (oak, hickory, sweetgum, red maple, winged elm) and needleleaf evergreen trees (mostly loblolly pine, shortleaf pine, other southern yellow pine species).

232 Outer Coastal Plain Mixed Forest Province – flat and irregular Atlantic and Gulf Coastal Plains areas; flat to gentle sloping to gentle rolling in relief; temperatures relatively steady across seasons; native vegetation comprised of temperate rainforest characterized by evergreen oaks and members of the laurel and magnolia families, with coastal marshes and interior swamps dominated by gum and cypress tree species; most upland areas covered by subclimax pine forest.

234 Lower Mississippi Riverine Forest Province – flat to gently sloping broad floodplain and low terraces made up of alluvium and loess; from near sea level in the south, altitude increases gradually to about 660 feet in the north; land of oxbow lakes and swamps are significant in the extreme southern portion of the province; warm winters and hot summers; rain falls throughout the year, with a minimum in autumn; temperature and precipitation decrease heading north; native vegetation comprised of bottom-land deciduous forest, with ash, elm, cottonwood, sugarberry, sweetgum, water tupelo, oak, bald cypress, and vines significant along water courses.

APPENDIX F
SAMPLE PRESS RELEASE ISSUED PRIOR TO BAITING ON LONG ISLAND, NY

THOMAS R. SUOZZI

PRESS RELEASE

NASSAU COUNTY
DEPARTMENT OF HEALTH

BOARD OF HEALTH

BRUCE A. LISTER, CHAIR
NORMA J. HENRIKSEN, VICE CHAIR
LAWRENCE RAVICH, M.D.
SAMUEL M. GELFAND, M.D.
JOAN L. CAEMMERER

Contact: Cynthia BrownDate: Sept. 8, 2004
(516) 571-3417

BAITING WITH RABIES VACCINE TO BEGIN

HELICOPTER AND GROUND DISTRIBUTION SCHEDULED

With an additional rabid raccoon reported on September 2, bringing the total to four in recent weeks, the New York State Department of Health and the United States Department of Agriculture, Wildlife Services (USDA) will be distributing raccoon rabies vaccine by helicopter and by hand to protect residents from rabies.

What: A low-flying helicopter will be dropping small packets of an oral rabies vaccine in raccoon habitats, including woods, bushes, stream beds, and dumpsters. Hand baiting will be targeted for more densely populated residential areas. The bait is a small plastic condiment-like plastic packet of liquid vaccine which is coated with fishmeal crumbles or presented as a brown fishmeal cube to attract raccoons.

When: Weather permitting, helicopter baiting: Thursday, September 9th – Friday, September 10th

Hand distribution: Thursday, September 9th – Sunday, September 12th.

Where: Over an approximate (to be determined)-mile radius from the site of the first rabid raccoon, primarily in the Town of Oyster Bay and parts of the Town of North Hempstead. The area to be covered by the helicopter is bounded by:

On the West:

On the North: **(to be announced)**

On the East:

On the South:

Why: **With four raccoons infected with rabies, there is a high probability that other raccoons are also infected. Because of the threat to wildlife and domestic animals from terrestrial rabies, action needs to be taken quickly to prevent rabies from becoming endemic here.**

Who: Veterinarians and wildlife biologists from the New York State Department of Health Zoonoses Program will conduct the vaccination program in cooperation with the USDA.

How: Raccoons are attracted by the scent of the bait and are immunized when they eat the contents of the packets.

Recommendations: The New York State and Nassau County Departments of Health recommends:

- **To avoid inadvertent contact with the baits, supervise children's outdoor activities both during and for approximately one week following the bait distribution.**

- **Keep all dogs and cats indoors or on leashes during the oral bait distribution and for about a week afterwards. This will allow raccoons to eat the vaccine-laden baits and become immunized and will decrease the chance of pets eating the baits.**

- **The baits are not harmful to dogs or cats, but a pet may vomit if they eat a large number of them. Do not try to remove a packet from an animal's mouth.**

- **<u>CONTACT THE POISON CONTROL CENTER AT 542-2323:</u>**

  - **Call immediately in the unlikely event that a child bites through the packet and ingests the liquid.**
  - **Wash hands immediately before calling to report the exposure if anyone comes in bare-hand contact with the bait (even if the bait is intact.) The bait packet itself will not harm anyone.**
  - **Call if you have seen your pet with bait in its mouth.**

- **Remember that it is not possible to get rabies from the vaccine. The vaccine does not contain the rabies virus. It does contain attenuated vaccinia virus. This is a weakened version of the virus used in people for smallpox vaccination.**

- **If residents find bait near their homes, but not in the open, leave it alone. The bait packets have a strong fishmeal smell that is not attractive to people or to most other animals. (There is a label that clearly identifies the bait packet: "Rabies Vaccine Live Vaccinia Vector. Do Not Disturb, Merial, Inc Us Vet Lic. No. 298 1-877-722-6725.")**

- **If the bait is intact and out in the open where pets or children are more likely to encounter it, toss it into deeper cover under trees or bushes while wearing gloves or using a plastic bag.**

- **Residents who see raccoons should <u>NOT</u> try to trap the raccoons themselves. Call a licensed trapper.**

General Information**: Rabies is a viral infection that affects the nervous system of raccoons and other mammals, including humans. The disease is always fatal once clinical signs of infection occur. Vaccination will greatly decrease the chance of human and domestic animal contact with rabid raccoons. Rabies is transmitted by the bite of a rabid animal. However, the virus may also be transmitted when the saliva of a rabid animal comes into contact with cut, open, or scratched skin lesions. To protect yourself from exposure to possible rabies:**

- Keep domestic animals (dogs, cats, ferrets) on a leash and keep livestock confined in the evenings.
- Do not touch or have contact with any animal other than your own.
- Do not touch dying or dead animals. If you must move them, use a shovel, wear heavy rubber gloves and double bag the carcass.
- Advise your family against approaching any unknown animal -- wild or domestic -- especially those acting in an unusual way.
- Instruct your children to tell you <u>immediately</u> if they were bitten or scratched by <u>any</u> animal.
- If a bat is found in a room where adults or children were sleeping, or if an adult enters a room and finds a bat with a child, DO NOT RELEASE THE BAT, notify the county health department immediately.
- Do not feed unknown animals and discourage them from seeking food near your home
- Keep garbage cans tightly covered and avoid storing any food outside.
- Verify that your pets have current rabies vaccination, including dogs, cats, ferrets, livestock and horses. Remember,
- New York State law requires all dogs, cats and domesticated ferrets to be vaccinated against rabies. Individuals bitten or scratched by any animal should call the Nassau County Department of Health and immediately contact their physicians or seek medical help at a hospital emergency room.

For information regarding rabies and baiting, call Nassau County Department of Health at (516) 571-2500 or the New York State Department of Health at (518) 474-3186 weekdays from 9:00 AM – 4:45 PM or visit the department website at www.co.nassau.ny.us/health or the state website at www.health.state.ny.us/nysdoh/zoonoses/rabies.htm.